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# TRANSACTIONS

OF THE

# *SOCIETY*

FOR THE ENCOURAGEMENT OF

# *ARTS, MANUFACTURES, & COMMERCE.*

Painted by Thos Uwins. Engraved by Chas Warren.

Chas Taylor M.D.

Late Secretary to the Society

for the Encouragement of Arts Manufactures & Commerce.

From a Miniature in the Posession of Mrs Taylor.

# TRANSACTIONS

OF THE

# SOCIETY,

INSTITUTED AT LONDON,

FOR THE

# ENCOURAGEMENT

OF

# ARTS, MANUFACTURES,

# AND COMMERCE;

WITH THE

Premiums offered in the Year 1817.

VOL. XXXV.

*LONDON:*

*PRINTED BY R. WILKS, CHANCERY-LANE:*

Sold by the HOUSEKEEPER, at the SOCIETY'S HOUSE, in the Adelphi; and by Messrs. BECKETT, HUNTER, CADELL and DAVIES, RICHARDSON, LONGMAN and Co. NORMANVILLE and FELL, EDWARDS, Newgate st. MURRAY, and T. WOODFALL, 14, Sloane-square, Chelsea.

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# PREFACE.

The Committee of Correspondence and Papers, in presenting the 35th Volume of the Transactions of the Society to the Members, and to the public at large, take the accustomed opportunity of introducing it by a few prefatory remarks.

The early appearance of the present Volume will, doubtless, be gratifying to the Society in general, both in itself, and as including a virtual pledge that equal assiduity will be employed in this department for the future. It is of great importance, both as regards the collection of the annual Subscriptions, and as encouraging the activity and attachment of individual Members, that the distribution of the yearly Volume should take place as early as possible after the Christmas vacation. The arrangements which have been made for this purpose will, it is hoped, become progressively more efficacious, and realize the entire wishes of the Society on this head.

The Portrait of the late Dr. Taylor is prefixed to this Volume. The Committee might with reason be accused of

neglect, if they allowed the opportunity thus offered to pass by without adding their tribute of respect to the memory of their deceased Secretary. The amenity of his manners, the zeal and cordial activity with which he fulfilled the various duties of his station, being yet recent in the recollection of the individual Members of the Society, require no eulogy. In early life he was engaged in the business of calico-printing, at the time when by the concurrent application of chemical and mechanical knowledge to the manufacture of cotton goods, the first impulse was given which has since carried this branch of our national industry to its present almost incredible magnitude. Among the meritorious contributors to the rapid progress of this manufacture, justice requires that the name of Dr. Charles Taylor be recorded. The idea of printing by machinery appears to have originated with him, and so active was he in the application of the then recent discoveries of Berthollet, as to be the first who produced for sale in the Manchester market an entire piece of calico bleached by oxymuriatic acid. The opulence which flowed so exuberantly on many of his fellow townsmen did not find its way to him, and he was glad to retire from the various harrassing circumstances attendant on the active pursuits of Commerce, to the less anxious, though scarcely less active situation of Secretary to this Institution. The place which he had acquired by an arduous and honourable competition, he occupied with credit to himself, and benefit

to

to the Society, till the advanced progress of a mortal and painful disease disqualified him from farther bodily activity: still his heart and his affections hovered round their accustomed resort, and among the last objects of his solicitude was the welfare of a Society to which, from habit and taste, he had become most warmly attached.

The ENGRAVINGS in the present Volume will be found to sustain the high reputation already acquired; and, notwithstanding the rapidly progressive improvement in the delineation and engraving of Machines inserted in our Cyclopædias and philosophical journals, the Transactions of the Society of Arts may successfully vie with the best of them in this respect. For one Plate, the view of Mr. ALLAN's Theodolite, intended to have been inserted in the former Volume, the Society is indebted to the liberality of Mr. ARMSTRONG. It is worthy of particular notice, both for the beauty of its execution, and as being one of the first productions of a machine invented by Mr. ARMSTRONG, for the purpose, not of etching, as is the case with the common machines, but of cutting the lines at once, and to their proper depth in the copper itself.

In the department of AGRICULTURE, including Machines for Agricultural purposes, the present Volume contains Communications on planting Forest Trees by J. LAWSON, Esq.

and on an Embankment on the Gnoll and Britton Ferry Marshes, by the Earl of JERSEY, and HENRY GRANT, Esq.

Mrs. D'OYLY has obtained a Medal for the successful culture of the Bull-Rush (Scirpus Lacustris), which, although a native of England, has never by its spontaneous produce superseded the necessity of importing the article from Holland, at an expence of many thousand pounds annually. It is the best material for matting and chair-bottoms, and therefore its consumption in this country is enormous.

Mr. ESSEX's Machine for cleaning corn is recommended with confidence as a very important appendage to the Thrashing-Mill. Taking up the process at the point to which it has been carried by the latter instrument, the grain is step by step separated from the fragments of straw, from the chaff, from the seeds of weeds, and the lighter grain; and, by friction and ventilation, comes out not only thoroughly cleaned from all impurities, but materially improved in dryness, and external aspect. At the same time, the chaff is freed from the dust, with which it is usually mixed in large proportion, and thus is rendered a more agreeable and nutritious food for horses, and other domestic animals.

In the Class of CHEMISTRY, Mr. WYNN's communications on the subject of Enamel Colours, and on the arts of staining and

and gilding glass and porcelain, will, doubtless, be considered as an acceptable present by those who engage in this interesting and elegant art, either as a profession or amusement. The resources of modern chemistry may probably simplify and improve some of the receipts; but, as a register of actual practice, in a branch of art for the most part involved in secrecy and empiricism, it possesses sterling value.

Mr. STILES has obtained a Medal for his method of freeing that common and cheap fish the Sprat from the rank oil with which it abounds, and then preparing an Extract from it in flavour not unlike that which is procured from the anchovy.

Mr. CALLENDER has been rewarded for a simple and expeditious method of seasoning mahogany of small scantling.

Of instruments for the purpose of giving to certain branches of drawing all that mechanism can bestow, namely precision, those contained in the present Volume are Mr. DICK's elaborate Machine for representing buildings and other definite objects in true perspective; Mr. WARCUP's Curvagraph, by which the complicated curves of the naval architect are readily constructed and tranferred to paper; Mr. WOOD's Parallel Rule; and Mr. HALL's Instrument for laying down Angles.

Dr.

Dr. Clanny's meritorious efforts in the construction of Safety Lamps have already attracted the favourable notice of the Society: The present Volume contains an improved lamp by the same gentleman, founded on the fact that the mixture of steam with the carburetted hydrogen of the coal mines, prevents the gas from exploding.

From the liberality and polite attention of the Right Hon. Sir J. Sinclair, the Society has become possessed of one of the Portable Mills, many thousands of which were in daily use in the armies of France during some of their most active and arduous campaigns. A figure and description of the machine are given in the present Volume.

The Time-Keeper of Mr. W. Wynn is remarkable for the ingenuity with which the maker has contrived to simplify this instrument, and diminish the friction; it exhibits, besides, much novelty and real improvement in the construction of the pendulum.

In the same department may be noticed Mr. Prior's Striking Part of a Clock, also remarkable for its great simplicity.

Mr. James Jones's Crane, though existing as yet only in a model, has been thought by the Society worthy of particular distinction, inasmuch as it possesses a power of self-adjustment,

adjustment, according to the various weights which it may have to raise, almost independent of the attending labourers.

The ardent wishes of the Society to contribute all in their power to the alleviation of such varieties of human misery as may apparently be effected by mechanical inventions, has induced them to confer repeated and liberal rewards on Life Boats, and other means of saving shipwrecked mariners; on Machines for superseding the present barbarous practice of cleaning chimnies by means of climbing boys; and on methods by which shoe-makers and other artizans may be enabled to perform their work standing, and may thus avoid the organic diseases attendant on a constrained sitting posture. The present Volume will show, that these objects still continue to occupy the attention of the Society. Captain Bray's Life Boat, Mr. Wilson's Chimney-sweeping Machine, and Mr. Coad's very ingenious and simple contrivance to enable shoe-makers to work standing, have, on this account, been liberally rewarded, and are recommended to the notice of those whom they may specially concern.

Mr. Conolly's Telegraph System has received the attention and reward to which, from its facility and expedition, it appears fairly entitled.

Mrs. M. A. Warren's Piano-Monitor, Mr. Saddington's Machine for covering Six Wires at once with Silk, Mr. Farnham's

Farnham's Steam Trap, Mr. Barchard's Traversing Rake, Mr. Caslon's Gas Lamp, Mr. Preston's Ventilator for Ships' Cabins, and Mr. Joseph Farey's very ingenious and effectual improvement on the common Ball-Cock, have each their peculiar merits, and as such have been proportionably distinguished.

Mr. Aust's Machine for freeing the Shaft-Horse of a loaded Cart when fallen, will, from its cheapness and simplicity, contribute, it is hoped, to obviate the serious consequences of those frequent and distressing accidents which are of daily occurrence in the crowded streets of the metropolis, and are the occasion of serious and lasting injuries to the most valuable of our domestic animals.

Mr. Onwin's Banding Plane will, no doubt, be found an important acquisition to those who are concerned in the manufacture of ornamental furniture.

Dr. Davis's Craniotomy Forceps, relating to a subject on which the Society at large has no experience, has been rewarded partly in consequence of the strong testimony afforded by those professional gentlemen who have favoured the Committee with their personal attendance on this occasion, and partly from deference to the authority of those eminent practitioners whose signatures are attached to the Certificate.

The

THE Society take the present opportunity of returning their Thanks to the different public bodies and individuals who have honoured them with presents during the Session, the particulars of which are noticed in the body of the Volume. Without presuming to direct in what channels the liberality of the Friends to this Institution shall flow, it may be stated, that such contributions as may put the Society in possession of a compleat collection of all the publications of any value on the application of Mathematics to practical Mechanics, will be especially acceptable.

*The Society desire it to be clearly understood, that, as a Body, they are not responsible for any opinion or representation of Facts contained in the following Pages.*

# PREMIUMS

OFFERED IN THE YEAR 1817,

*BY THE SOCIETY*

INSTITUTED FOR THE ENCOURAGEMENT

OF

*ARTS, MANUFACTURES, AND COMMERCE,*

IN THE ADELPHI, LONDON.

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*THE Meetings of the Society are held at their House in the Adelphi, London; and the consideration of the Claims, offered in the present List, will take place during the Session of the Society commencing on Wednesday the 6th of November,* 1817.

# *ADVERTISEMENT TO THE PUBLIC.*

THE chief object of the SOCIETY is to promote the Arts, Manufactures and Commerce of this Kingdom, by giving honorary or pecuniary Rewards, as may be best adapted to the case, for all such useful Inventions, Discoveries, and Improvements, (though not mentioned in this advertisement) as tend to that purpose; and, in pursuance of this plan, the Society have already expended above EIGHTY THOUSAND POUNDS, advanced by voluntary subscriptions of Members, and legacies bequeathed.

The Register of Premiums and Bounties which they have given, and which may be seen at the SOCIETY's house in the Adelphi, will show the very great advantages derived by the Public from this Institution.

The meetings of the SOCIETY are held every Wednesday, at seven o'clock in the evening, from the first Wednesday in November to the second Wednesday in June. The several Committees meet on other evenings in the week during the session, as particularly mentioned in their printed book of Rules and Orders.

In order still farther to promote the laudable Views of the SOCIETY, it may be necessary to explain the mode by which Members are elected.

Each Member has the privilege, at the meeting of the SOCIETY, or by letter to the Secretary, to propose any person who is desirous to become a Member; such proposal to contain the name, full addition, and place of abode, of the proposed Member, and to be signed by three members of the SOCIETY.

Peers of the Realm or Lords of Parliament are, on their being proposed, immediately ballotted for; the names of other persons proposed to become Members are read by the Secretary at the next meeting of the SOCIETY, and are then inserted in lists which are hung up in the SOCIETY's room; they are ballotted for at the second following ordinary meeting. In both cases, if two-thirds of the Members then voting ballot in their favour, they are deemed Perpetual Members upon payment of not less than Twenty Guineas in one sum, or Subscribing Members upon payment of any sum not less than Two Guineas annually.

All Members are entitled to vote and assist in all the business of the SOCIETY and the several Committees. The Members have also the privilege of recommending two persons as auditors at the meetings of the SOCIETY; and, by addressing a note to the housekeeper, of introducing their friends to examine the various Models, Machines, and Productions, in different branches of Arts, Manufactures, and Commerce, for which rewards have been bestowed; also to inspect the magnificent series of Moral and Historical Paintings, executed by the late J. BARRY, Esq. which, with some valuable Busts, Statues, &c. decorate the Great Room.

Members have the use of the Society's Library, which is valuable and annually increasing by the purchase and donation of scientific and useful books and of engravings. The SOCIETY are highly sensible of the great importance of such acquisitions, and are happy to record them, with the names of the donors, in the Volume annually published of the SOCIETY's Transactions, to which the Members are intitled.

Ladies are eligible, as Members of the SOCIETY, to all the Privileges thereof, and alone are entitled to vote by proxy at elections, through the medium of any gentleman who is a member, on his producing a written authority for the same.

The time appointed for admission to the Paintings or Models, is from ten to two o'clock, Sundays and Wednesdays excepted.

ORDERED, SOCIETY'S HOUSE, ADELPHI, JUNE 1st, 1815.

*That the several candidates and claimants, to whom the Society shall adjudge Premiums or Bounties, do attend as required by the Secretary, on the last Tuesday in May, 1817, at eleven o'clock in the forenoon precisely, to receive the same; that Day being appointed by the Society for the Distribution of their Rewards; and before that time no Premium or Bounty will be delivered, except to those who are about to leave the Kingdom.*

*In cases where the Society may think fit to admit excuses for not attending in person, deputies may be substituted to receive the Rewards, provided such Deputies are either Members of the Society, or superior Officers thereof.*

# *A LIST of the Officers of the* SOCIETY, *and Chairmen of the several Committees.*

## PRESIDENT.

His Royal Highness the DUKE of SUSSEX, K. G. &c. &c.

### VICE-PRESIDENTS.

John, Duke of Bedford, F.S.A.
Hugh, Duke of Northumberland, F.R.S. and F.S.A.
G. G. L. Marquis of Stafford, K.G.
Jacob, Earl of Radnor, F.R.S. and F.S.A.
Robert, Earl of Liverpool, F.R.S.
Charles, Earl of Romney, F.R.S.
Hugh Earl Percy.
Sir Robert Peel, Bart, M.P.
Sir Watkin Lewes, Knt.
Sir Nathaniel Conant, Knt.
Thomas Pitt, Esq. F.S.A.
Richard Clark, Esq. Chamberlain, F.S.A.
Richard Powell, M.D.
John Christian Curwen, Esq. M.P.
Richard Wilson, Esq. F.S.A.
Joseph Hume, Esq.

### CHAIRMEN OF COMMITTEES.

*Accounts.*

William Lumley, Esq.
Abraham Osorio, Esq.

*Correspondence and Papers.*

William Tooke, Esq.
Daniel Moore, Esq. F.R.S. & F.S.A.

*Polite Arts.*

J. T. Barber Beaumont, Esq. F.S.A.
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*Agriculture.*

T. H. Andrew, Esq.
Charles Waistell, Esq.

*Manufactures.*

James Pearsall, Esq.
John Smith, Esq.

*Mechanics.*

Thomas Gill, Esq.
Bryan Donkin, Esq.

*Chemistry.*

Henry Coxwell, Esq.
G. D. Midgley, Esq.

*Colonies and Trade.*

William Lewis, Esq. F.L.S.
William Vaughan, Esq. F.R.S.

*Miscellaneous Matters.*

William Kirkby, Esq.
Daniel Beaumont, Esq.

SECRETARY, Arthur Aikin, Esq.
ASSISTANT SECRETARY, Mr. Thomas Woodfall.
HOUSEKEEPER, Miss A.B. Cockings.
COLLECTOR, Mr. Robert Elwin.

# *PREMIUMS offered in* 1817, *by the* SOCIETY *instituted at* London, *A. D.* 1754, *for the Encouragement of Arts, Manufactures, and Commerce.*

## PREMIUMS IN AGRICULTURE.

*THE Candidates for planting all kinds of trees are to mention the nature of the soil, to produce certificates that the respective plantations are properly fenced and secured, and particularly to state the condition of the plants at the time of sending such certificates. Any information which the candidates for the following premiums may choose to communicate, relative to the methods made use of in forming the plantations, or promoting the growth of the several trees, or any other observations that may have occurred on the subject, will be thankfully received.*

*It is the intention of the Society that such lands only as are not calculated for the purposes of husbandry, should be employed for the purposes specified in these advertisements relative to plantations.*

### ACORNS.

1 FOR having set between the first of October, 1815, and the first of April, 1816, the greatest quantity of land, not less than ten acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

2. For the second greatest quantity of land, not less than five acres, set agreeably to the above conditions; the silver medal.

*Certificates* of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks on each acre, to be delivered to the Society on or before the first Tuesday in February, 1818.

### RAISING OAKS.

3. To the person who shall have raised, since the year 1813, the greatest number of oaks, not fewer than five thousand, either from young plants or acorns, in order to secure a succession of oak timber in this kingdom; the gold medal.

4. For the next greatest number, not fewer than three thousand; the silver medal.

*Certificates* that there were on the land at least the number of young oak trees required, in a thriving condition, two years after the planting, with an account of the methods pursued in making and managing the plantation, to be produced to the Society on or before the first Tuesday in February, 1818.

### ASCERTAINING THE BEST METHOD OF RAISING OAKS.

5. To the person who shall ascertain in the best manner by actual experiments, the comparative merits of the different modes of raising oaks for timber, either from acorns set on land properly dug or tilled, from acorns set by the spade or dibble, without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover; or from young plants previously raised in nurseries, and transplanted; regard being had to the expense, growth, and other respective advantages of the several methods; the gold medal.

The *accounts*, and proper *certificates* that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the first Tuesday in February, 1818.

### ELM.

6. For having planted the greatest number of the English elm, not less than eight thousand, between the twenty-fourth of June, 1815, and the twenty-fourth of June, 1816, and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

7. For the second greatest number, not less than five thousand; the silver medal.

*Certificates* of having planted agreeably to the above conditions, that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants, to be delivered to the Society on or before the first Tuesday in April, 1818.

### LARCH.

8. For having planted out, between the twenty-fourth of June, 1814, and the twenty-fourth of June, 1815, the greatest number of larch trees, not fewer than five thousand, and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

9. For the next greatest number, not fewer than three thousand; the silver medal.

*Certificates* of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in January, 1818.

*N. B.* The larch trees may be planted either mixed with other trees, or by themselves, as may best suit the convenience of the planter.

### ASH.

10. For having sown or set, in the year 1814, the greatest quantity of land, not less than six acres, with ash for timber, with or without seeds, cuttings, or plants, of such other trees as are adapted to the soil; the gold medal.

11. For the next greatest quantity, not less than four acres; the silver medal.

*Certificates* of the sowing or setting, agreeably to the above conditions, that

there are not fewer than six hundred ash plants on each acre, in a thriving and healthy condition, two years at least after the sowing or setting, with a general account of the methods used in making the plantation; to be delivered to the Society on or before the last Tuesday in January, 1818.

### FOREST TREES.

12. To the person who shall have enclosed and planted, or set, the greatest number of acres (not less than ten) of land that is incapable of being ploughed, such as the borders of rivers, the sides of precipices, and any land that has too many rocks, or that is not calculated to re-pay the expense of tillage, owing to the surface being too hilly, mountainous, or otherwise unfit for tillage, with the best sorts of forest trees, namely, oak, Spanish chesnuts, ash, elm, beech, alder, willow, larch, spruce, and silver fir, with or without screens of Scotch fir adapted to the soil, and intended for timber trees, between the first of October, 1814, and the first of April, 1815; the gold medal.

13. For the second greatest quantity of land; not less than seven acres; the silver medal.

A particular *account* of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper *certificates* that they were in a healthy and thriving state two years at least after making the plantations, to be delivered to the Society on or before the second Tuesday in January, 1818.

*N. B.* With the above forest trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

### NORWAY FIR SEEDLINGS.

14. To the person who shall have planted in the united kingdom, during the year 1815, the greatest number, not less than two thousand, of red wood and white wood Norway fir seedlings, at sufficient distances from each other to stand for timber trees; the gold medal.

*Certificates* of the number of plants, that they were in a thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the first Tuesday in January, 1818.

*N. B.* It is recommended to plant the seedlings of about three or four years growth, and in a moderately good soil, somewhat sheltered; the wood from the district of Christiania is esteemed the best for carpenters' and joiners' use: and for spars and upers the trees near to Long Sound are most valued.

### CHESNUTS.

15. For having sown or set between the first of October, 1815, and the first of April, 1816, the greatest quantity of land, not less than six acres, with Spanish chesnuts, with or without seeds, cuttings, or plants of other trees, adapted to such soil, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

16. For the second greatest quantity, not less than four acres; the silver medal.

*Certificates* of sowing or setting, agreeably to the above conditions, and that there are not fewer than three hundred chesnut plants in a thriving state, on each acre, to be delivered to the Society on or before the first Tuesday in February, 1818.

### WALNUT TREES.

17. For having planted the greatest number of walnut trees, not less than five hundred, between the 24th of June, 1815, and the 24th of June, 1816, and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

18. For the next greatest number, not fewer than three hundred; the silver medal.

*Certificates* of having planted agreeably to the above conditions, and that the plants were in a healthy and thriving state two years at least after making the plantations, and specifying the distance of the plants from each other, to be delivered to the Society on or before the first Tuesday in April, 1818.

### WALNUTS.

19. To the person who shall invent and discover to the Society an improved mode of propagating the superior varieties of walnuts, either by budding, grafting, or any other mode, except sowing; the gold medal.

*Certificates* that not less than fifty trees have been so raised, with a full *account* of the method practised, to be produced to the Society on or before the first Tuesday in April, 1819.

### SECURING PLANTATIONS OF TIMBER TREES AND HEDGE ROWS.

20. To the person who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method of securing young plantations of timber trees and hedge rows, from hares and rabbits, as

well as from sheep and large cattle, which at the same time shall be least subject to the depredations of wood-stealers; the silver medal.

The *accounts*, and *certificates* of the efficacy of the method, to be produced to the Society on or before the last Tuesday in December, 1817.

## WHEAT, COMPARATIVE CULTURE OF, BROAD-CAST, DRILED, AND DIBBLED.

21. For the best set of experiments, made on not less than twelve acres, four of which to be sown broad-cast, four drilled, and four dibbled, the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat; the gold medal.

It is required that every operation and expense of each mode of culture be fully described; and that proper certificates of the nature and condition of the land on which the experiments were made, together with an *account* of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in February, 1818.

## BEANS.

22. To the person who shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse-beans or tick beans, that will ripen their seeds before the 21st of August; the silver medal.

It is required that a particular account of the bean, the cultivation, and the expense attending it, with proper *certificates* of the nature and condition of the land on which the experiments were made, together with an *account* of the produce, the weight per Winchester bushel, and a sample of not less than a peck, be produced to the Society on or before the first Tuesday in February, 1818. It is apprehended that if a bean should be brought into cultivation with the habits of hotspur, or other early peas, it would in a great measure escape the danger arising from the collier insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat.

## PARSNIPS.

23. To the person who shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the particular purpose of feeding cattle or sheep; the gold medal.

*Certificates* of the quantity of land so cultivated, with a particular *account* of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the second Tuesday in February, 1818.

## BUCK WHEAT.

24. To the person who shall cultivate the greatest quantity of land with buck wheat, not less than thirty acres; the gold medal.

It is required that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, the manner of reaping it, thrashing it, and housing the grain; with proper *certificates* of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year, together with an *account* of the produce, and a sample of the seed, not less than a quart, be produced to the Society on or before the second Tuesday in January, 1818.

25. For the next greatest quantity, not less than fifteen acres, on similar conditions; the silver medal.

*Information respecting its application to the feeding of cattle, hogs, and poultry, and other of its uses, is also desired. It is known to be particularly serviceable in furnishing honey to bees.*

## GRASS SEEDS.

26. To the persons who shall raise the greatest quantity of each or any of the following named grass seeds, *viz.*—Meadow fox-tail (alopecurus pratensis), sweet-scented vernal grass (anthoxanthum odoratum), Timothy grass (phleum pratense), meadow fescue grass (festuca pratensis), smooth-stalked meadow grass (poa pratensis), rough-stalked meadow grass (poa trivialis); rough cock's-foot (Dactylis glomerata) perennial ray-grass (Lollium perenne) the silver medal.

It is required that *certificates* from persons who have viewed them in a proper state to identify that they are one or other of the seeds above-mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the first day of February, 1818.

## HEMP.

27. The Society, wishing to encourage the growth of hemp for the use of the Navy in every part of the united Empire, offer to the person who shall have sown with hemp, in drills at least eighteen inches asunder, the greatest quantity of land in any

part of the United Empire, not less than fifty acres statute measure, in the year 1816, and shall have at the proper season caused to be plucked the summer hemp, (or male hemp bearing no seed) and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal.

28. To the person who shall sow with hemp, in drills at least eighteen inches asunder, the next greatest quantity of land in any part of the United Empire, not less than twenty-five acres, statute measure, in the year 1817, and shall at the proper season cause the same to be plucked as abovementioned; the silver medal.

*Certificates* of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general *account* of the soil, cultivation, and produce, to be delivered to the Society, along with fourteen pounds of the hemp and two quarts of the seed, on or before the second Tuesday in February, 1818.

## POTATOES.

29. To the person who shall, in the year 1817, cultivate the greatest quantity of land which has not been used for the cultivation of potatoes for the space of twelve years past, not less than fifty acres, with potatoes of such qualities as to be fit for the use of the table in the months of April, May, and June, after their growth the preceding year; the gold medal, or thirty guineas.

30. For the next greatest number, not less than twenty acres; the silver medal, or fifteen guineas.

Proper *certificates*, along with other necessary particulars, to be delivered in to the Society on or before the first Tuesday in April, 1818.

31, 32. These premiums are extended one year further on similar conditions.

## PRESERVING TURNIPS.

33. To the person who shall discover to the Society the best and cheapest method of preserving turnips perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

It is required that a full and accurate *account* of the method employed, and the expense attending the process, together with *certificates* that the produce of four acres at the least has been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of February, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips; and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the last Tuesday in February, 1818.

34. For the next in quantity and merit, on not less than two acres; the silver medal.

## PRESERVING CABBAGES.

35. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

36. For the next in quantity and merit, on not less than two acres; the silver medal.

Conditions the same as for preserving turnips, Art. 33.—And the *accounts* to be produced on or before the last Tuesday in February, 1818.

## PRESERVING CARROTS, PARSNIPS, BEETS, OR MANGEL WORZEL.

37. To the person who shall discover to the Society the best and cheapest method of preserving carrots, parsnips, beets, or mangel worzel, perfectly sound, and in every respect fit for the purpose of supporting horses and fattening sheep and neat cattle, during the months of February, March, and April; the gold medal.

Conditions the same as for preserving turnips, Art. 33.—And the *accounts* to be delivered in on or before the last Tuesday in February, 1818.

38. For the next in quantity and merit, on not less than two acres; the silver medal.

## MAKING MEADOW-HAY IN WET WEATHER.

39. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of making meadow hay in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than fifty-six pounds of the hay; and *certificates* that at least the produce of six acres of land has been made according to the method described, and that the whole is of equal quality with the sample; to be produced on or before the first Tuesday in February, 1818.

## HARVESTING CORN IN WET WEATHER.

40. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and *certificates* that at the least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples; to be

produced on or before the first Tuesday in February, 1818.

### GAINING LAND FROM THE SEA.

41. To the person who shall have gained the greatest quantity of land from the sea, not less than fifty acres, on the coast of Great Britain or Ireland; the gold medal.

*Certificates* of the quantity of land, and that the experiments were begun after the first of January, 1812, to be produced to the Society on or before the first Tuesday in February, 1818.

42. The same premium is extended one year further.

### IMPROVING LAND LYING WASTE.

43. For the most satisfactory *account* of the best method of improving any one of the following soils, being land lying waste and uncultivated, *viz.* clay, gravel, sand, chalk, peat earth, or bog, verified by experiments on not less than fifty acres of land; the gold medal.

44. For the next greatest quantity, not less than thirty acres; the silver medal.

It is required, that the land, before such improvement, be absolutely uncultivated, and in a great measure useless, and that, in its improved state, it be enclosed and cultivated.

*Certificates* of the number of acres, of the quality of the land so improved, with a full *account* of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced on or before the first Tuesday in February, 1818.

### SPADE HUSBANDRY.

45. For the best set of experiments, made on not less than eight acres of land, four of them to be cultivated by the ordinary mode, and four by the spade; for the purpose of ascertaining the comparative advantages of the plough and spade culture as applied to any one of the following crops: viz. flax, lucern, carrots, parsnips, mangel worzel or turnips; the gold medal or thirty guineas.

It is required that each mode of culture be fully described, and that proper *certificates* of the nature and condition of the land on which the experiments are made, together with the expence attending each mode, as also of the produce of each, be sent to the Society on or before the first Tuesday in February, 1818.

### MANURES.

46. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following manures, used as top-dressings on grass and corn land, *viz.* soot, coal-ashes, wood-ashes, lime, gypsum, bones, night-soil, or any other fit article; the gold medal.

It is required that the above experiments be made between two or more of the above-mentioned manures, and that not less than two acres of land be dressed with each manure.

An *account* of the nature of the soil, quantity, and expense of the manure and crops, with *certificates*, to be produced on or before the last Tuesday in February, 1818.

### RAISING WATER FOR THE IRRIGATION OF LAND.

47. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to, and cheaper than any other method now in use; the gold medal, or fifty guineas.

A model, on a scale of one inch to a foot, with *certificates* that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it was raised, to be produced to the Society on or before the first of March, 1818.

### PARING PLOUGH.

48. To the person who shall invent and produce to the Society a machine or plough for the purpose of paring land preparatory to burning, superior to any hitherto known or in use for such purpose, and to be worked by not more than one man and two horses; the silver medal, or twenty guineas.

The machine, and *certificates* that at least ten acres have been pared by it in a proper manner, to be produced to the Society on or before the first of February, 1818.

### MACHINE FOR DIBBLING WHEAT.

49. To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths; the silver medal and ten guineas.

The *machine*, with *certificates* that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in February, 1818.

### MACHINE FOR REAPING OR MOWING CORN.

50. For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats or beans, by which it may be done more expeditiously and cheaper than by any method now practised, provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such manner that it may be easily gathered up for binding; the gold medal.

The *machine*, with *certificates* that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in January, 1818. Simplicity and cheapness in the construction of this and the preceding machine, will be considered as principal parts of their merit.

### THRASHING MACHINE.

51. To the person who shall invent a machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at a less expense, than by any method now in use; the gold medal.

The *machine* or a model, with proper *certificates* that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1818.

### DESTROYING THE GRUB OF THE COCKCHAFER.

52. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, or of preventing or checking the destructive effects which always attend corn, peas, beans, and turnips, when attacked by those insects; the gold medal.

The *accounts*, with proper *certificates*, to be produced on or before the first Tuesday in February, 1818.

### DESTROYING WORMS.

53. To the person who shall discover to the Society, an effectual method, verified by repeated and satisfactory trials, of destroying worms, or of preventing the destructive effects they occasion on corn, beans, peas, or other pulse; the silver medal.

The *accounts*, with proper *certificates*, to be produced to the Society, on or before the first Tuesday in February, 1818.

### DESTROYING THE FLY ON HOPS.

54. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known or practised, on not less than four acres of hop ground; the gold medal.

*Accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1818.

### PREVENTING THE BLIGHT, OR RAVAGES OF INSECTS, ON FRUIT TREES AND CULINARY PLANTS.

55. To the person who shall discover to the Society the most effectual method of preventing the blight or ravages of insects on fruit trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments; the gold medal.

The *accounts*, with proper *certificates*, to be delivered to the Society on or before the second Tuesday in February, 1818.

### FOR SCRAPING THE BARK OF FRUIT TREES.

56. To the person who shall send to the Society the best account of experiments made by scraping the bark of fruit trees, according to the plan recommended by Sir John Sinclair, in his Treatise on the subject; the silver medal.

*Certificates* that the experiments have succeeded, to be sent to the Society on or before the first Tuesday in March, 1818.

### CURE OF THE ROT IN SHEEP.

57. To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments; the gold medal.

It is expected that the candidates furnish accurate *accounts* of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper *certificates*, must be delivered to the Society on or before the first Tuesday in February, 1818.

### CURE OF THE FOOT-ROT IN SHEEP.

58. To the person who shall discover to the Society the best and most effectual method of curing the foot-rot in sheep; the silver medal.

It is required that the cure be ascertained by repeated and satisfactory experiments, and the method of performing it be verified by proper *certificates*, delivered to the Society on or before the first Tuesday in February, 1818.

### PREVENTING THE ILL EFFECTS OF FLIES ON SHEEP.

59. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies; the silver medal.

It is required that the method be ascertained by repeated experiments, and that a *certificate* of its efficacy be delivered to the Society on or before the first Tuesday in February, 1818.

### PROTECTING SHEEP.

60. To the person who, in the year 1816, shall have protected the greatest number of sheep, not fewer than one hundred, by hovels, sheds, or any other means; the gold medal.

A particular *account* of the experiments made, with the advantages arising therefrom, together with the expense, and *certificates* of its utility, to be produced to the Society on or before the first Tuesday in March, 1818.

N.B. It is required that the *certificates* shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

### FEEDING CATTLE.

61. For the best experiments on stall-feeding of cattle (not less than five head), to be continued for the space of twelve months, in order to prove the earliest maturity and greatest propensity to fatten, of the most approved breeds of cattle in Great Britain, or Ireland, specifying the nature of the food given, together with the daily consumption of each beast, with its weekly increase in weight, and such other observations as may be deemed of consequence; the gold medal.

A full *account* of the methods employed, and of the expenses attending the same, and *certificates* of the sundry matters stated, to be produced on or before the second Tuesday in January, 1818.

### BEES, WAX, AND HONEY.

62. To the person who shall erect, previous to the first day of September, 1817, an apiary, containing the greatest number of hives or boxes stocked with bees, not less than one hundred; the silver medal, or twenty guineas.

63. For the next greatest number, not fewer than fifty stocks; ten guineas.

Proper *certificates* of the number of stocks, and that they have been in the possession of the claimant during the preceding summer, to be produced to the Society on or before the first Tuesday in March, 1818.

It is expected that the claimant will give such particular information on the subject, as may tend to benefit the public, and enable other persons to keep bees to advantage; also that improved methods be made use of in their management, and particularly that the bees be not destroyed in order to obtain their honey and wax.

## PREMIUMS FOR DISCOVERIES AND IMPROVEMENTS IN CHEMISTRY, DYEING, AND MINERALOGY.

### PRESERVING SEEDS OF VEGETABLES.

64. For the best method of preserving seeds of plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the last Tuesday in December, 1817; the gold medal, or thirty guineas.

### PREVENTING THE DRY-ROT IN TIMBER.

65. To the person who shall discover to the Society the cause of the dry-rot in timber, and disclose a certain method of prevention superior to any hitherto known; the gold medal, or thirty guineas.

The *accounts* of the cause and method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the last Tuesday in Dec. 1817.

### PRESERVING SALTED PROVISIONS FROM BECOMING RANCID OR RUSTY.

66. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from becoming rancid or rusty; the gold medal, or thirty guineas.

A full *description* of the method, with proper *certificates* that it has been found on repeated trials to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1818.

### REFINING WHALE OR SEAL OIL.

67. For disclosing to the Society an effectual method of purifying whale or seal oil from the glutinous matter that incrusts the wicks of lamps, and extinguishes the light though fully supplied with oil; the gold medal, or fifty guineas.

It is required that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of the claim; and *certificates* that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil in its unpurified state, and two gallons so refined, to be produced to the Society on or before the second Tuesday in February, 1818.

### MANUFACTURING TALLOW CANDLES.

68. To the person who shall discover to the Society a method of hardening or otherwise

preparing tallow, so that candles may be made of it which will burn as clear and with as small a wick as wax candles, without running, and may be afforded at a less expense than any at present made with spermaceti; the gold medal, or fifty guineas.

*Certificates* that 112lb. of such tallow have been made into candles, and 12lb. of the candle made thereof, to be produced to the Society on or before the second Tuesday in January, 1818.

## CANDLES FROM RESIN, OR OTHER SUBSTANCES.

69. To the person who shall discover to the Society the best method of making candles of resin, or any other substance fit for common use, at a price much inferior to those made of tallow only; the gold medal, or thirty guineas.

Six pounds at least of the candles so prepared, with an *account* of the process, to be delivered to the Society on or before the last Tuesday in December, 1817.

## INCREASING STEAM.

70. To the person who shall invent and discover to the Society a method, verified by actual experiments, of increasing the quantity or force of steam in steam-engines, with less fuel than has hitherto been employed, provided that in general the whole amount of the expenses in using steam engines may be considerably lessened; the gold medal, or fifty guineas.

To be communicated to the Society on or before the first Tuesday in January, 1818.

## SUBSTITUTE FOR TAR.

71. To the person who shall invent & discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of the United Kingdom and its Colonies; the gold medal, or one hundred guineas. A quantity of the substitute, not less than one hundred weight, with *certificates* that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an *account* of the process, to be delivered to the Society on or before the first Tuesday in March, 1818.

N. B. Considerable quantities of tar are produced in Sweden and Norway from the roots of fir trees burnt for that purpose.

## TURPENTINE FROM THE SCOTCH FIR, OR PINUS SYLVESTRIS.

72. For the greatest quantity of turpentine, not less than two hundred weight, prepared in Great Britain, from that species of fir called the Scotch fir, or Pinus sylvestris, Linn.; the gold medal.

*Certificates* of the turpentine being prepared from such trees of British growth, together with fifty-six pounds of the turpentine, to be delivered to the Society on or before the second Tuesday in January, 1818.

73. For the next greatest quantity prepared, not less than one hundred weight, on similar conditions; the silver medal.

N. B. The Society being in possession of the method practised for extracting turpentine from trees whilst growing, and of samples so procured, information will be given upon that subject, on application for that purpose, at the Society's house.

## PREPARATION OF TAN.

74. To the person who shall prepare, in the most concentrated form, so as to be easily portable, and at a price applicable to the purposes of manufacturers, the largest quantity, not less than one hundred weight, of the principle called *tannin*, which abounds in oak bark and many other vegetable substances; the gold medal, or thirty guineas.

*Certificates* of the superior quality of the quantity so prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1818.

## INDELIBLE INK.

75. To the person who shall discover to the Society a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not dearer than that which is now in common use; the silver medal, or fifteen guineas.

*Certificates* that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above mentioned, with a full detail of the process of making it, and two quarts of the ink, to be delivered to the Society on or before the second Tuesday in January, 1818.

## PREPARATION OF A RED STAIN FOR COTTON CLOTH.

76. To the person who shall communicate to the Society the most effectual method of printing or staining cotton cloths with a red colour, by an immediate application of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder; the gold medal, or fifty guineas.

*Certificates* that the above process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length; one piece of the calico so printed, one pound of the colour, and a full *account* of the preparation and application, to be produced to the Society on or before the second Tuesday in January, 1818.

## PREPARATION OF A GREEN COLOUR FOR PRINTING COTTON CLOTH.

77. To the person who shall communicate to the Society the best method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld, and the solutions of indigo; the gold medal, or fifty guineas.

*Certificates* and conditions as for Premium 76.

## WHITE SUBSTANCE FOR THE BASIS OF PAINT.

78. To the person who shall produce to the Society the best white substitute, superior to any hitherto known, for the basis of paint, equally proper for the purpose as the white-lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white-lead, the gold medal, or one hundred guineas.

A quantity of the substitute, not less than 50lb. weight, with an *account* of the process used in preparing it, and *certificates* that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in January, 1818.

## PERMANENT WHITE PAINT FOR THE USE OF ARTISTS.

79. To the person who shall produce to the Society a white paint for oil, superior to any hitherto known, and which is not liable to be discoloured by exposure to light or to sulphuretted hydrogen gas; the gold medal, or thirty guineas.

A full account of the process, and 1lb. of the colour to be produced to the Society, on or before the second Tuesday in January, 1818.

## RED PIGMENT.

80. To the person who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use in oil or water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; the gold medal, or fifty guineas.

One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1818.

*N. B.* It is not required that the colour should resist the action of fire, or of chemical applications, but remain unaltered by the common exposure to strong light, damps, and noxious vapours.

## ULTRAMARINE.

81. To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, and durability, to the best prepared from lapis lazuli, and which may be afforded at a cheaper rate; the gold medal, or thirty guineas.

The conditions are the same as in the preceding Premium for the red pigment.

## DESTRUCTIVE EFFECTS FROM MOTHS.

82. To the person who shall discover to the Society a cheap, easy, and effectual method, verified by repeated and satisfactory trials, of preventing the destructive effects occasioned by moths and other insects, in furs, woollens, and other articles, superior to any hitherto known or practised; the silver medal, or fifteen guineas.

The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1818.

## STATUARY MARBLE.

83. To the person who shall discover, within great Britain or Ireland, a quarry of white marble fit for the purposes of statuary, and equal to those kinds now imported from Italy; the gold medal, or one hundred guineas.

A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and *certificates* of its possessing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1818.

*N. B.* In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and express their opinion of its value to the candidate before the block required by the above premium is produced.

## PREPARATION OF SULPHURIC ACID, FROM SULPHUR, WITHOUT THE USE OF ANY NITRIC SALT.

84. To the person who shall prepare the largest quantity (not less than one ton) of sulphuric acid from sulphur, without any nitric salt, of a specific gravity not inferior to the best sulphuric acid of commerce; the gold medal, or fifty guineas.

*Certificates* that not less than the above quantity of such an acid has been prepared, together with a sample, to be produced to the Society on or before the first Tuesday in January, 1818.

## PREPARATION OF ANY ALKALINE OR EARTHY NITRATE.

85. To the person who shall prepare, in Great Britain, the largest quantity, not less than

one hundred weight, of any salt of nitric acid, with either earths or alkalies, by a method superior to, and as cheap as those hitherto practised; the gold medal, or one hundred guineas.

*Certificates* of the above quantity having been prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1818.

## FINE BAR IRON.

86. To the person, in Great Britain, who shall make the greatest quantity of bar-iron, not less than ten tons, with coak, from coak pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel; the gold medal, or fifty guineas.

Samples, not less than one hundred weight, with *certificates* that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in January, 1818.

## PRESERVING IRON FROM RUST.

87. To the person who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust; the gold medal, or fifty guineas.

A full description of the method of preparing the composition, with *certificates* that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the first Tuesday in January, 1818.

## GLAZING EARTHEN-WARE WITHOUT LEAD.

88. To the person who shall discover to the Society, the cheapest, safest, most durable, and most easily fusible composition, fit for the purpose of glazing the ordinary kinds of earthen-ware, without any preparation of lead, and superior to any hitherto in use; the gold medal, or thirty guineas.

Specimens of the ware so glazed, with proper *certificates* of its having succeeded, and a sample of the materials made use of, to be produced to the Society on or before the first Tuesday in February, 1818.

## REFINING COPPER FROM THE ORE.

89. To the person who shall discover to the Society a method of separating, purifying, and refining copper from the ore, so as to render it fit for those purposes to which fine copper is now applied, and by a process cheaper than and superior to any hitherto known or in use; the gold medal, or fifty guineas.

*Certificates* that not less than three tons have been so prepared or refined, and a quantity not less than one hundred weight of the copper so refined, to be produced to the Society on or before the first Tuesday in February, 1818.

## PREVENTING THE ILL EFFECTS OF SMELTING ORES.

90. To the person or persons who shall invent and discover to the Society the most effectual method or methods of preventing the ill effects arising to vegetation and animal life, from the sulphureous arsenical, or other noxious fumes disengaged in smelting the ores of copper, zinc, lead, tin, iron, &c. in the large way, and if possible, of converting those pernicious fumes to useful purposes, in a manner superior to any hitherto known or in use; the gold medal, or fifty guineas.

It is required that a full *account* of the process employed, with *certificates* of its being successfully carried into effect, be produced to the Society on or before the first Tuesday in March, 1818.

## PREPARING BRASS.

91. To the person or persons who shall discover a method of making brass from materials the produce of Great Britain or Ireland, of superior quality to that commonly manufactured in this country, and equal to foreign brass: the gold medal or thirty guineas.

A full *account* of the process, and of the ingredients employed, together with their proportions, and *certificates* that one ton has been so manufactured, and a sample of the brass, not less than 14 lbs. to be produced to the Society on or before the last Tuesday in January, 1818.

## DYEING SILK OR WOOLLEN.

92. To the person who shall discover a method of dyeing silk or woollen, of any colours, superior to the same produced by other British dyers, and equal to those produced by the continental dyers; the gold medal or thirty guineas.

A full *account* of the process and ingredients employed, together with their proportions attested by satisfactory *certificates*, as well as samples of the silk and woollen in its undyed and dyed state, to be produced to the Society on or before the first Tuesday in January, 1818.

## RENDERING LEATHER WATER-PROOF.

93. To the person who shall discover a method, superior to any now in use, and of moderate price, of rendering leather water-proof, without injuring its texture or pliability, the silver medal or 15 guineas.

A full *account* of the process, and of the ingredients employed, together with their proportions, attested by satisfactory *Certificates*, as well as samples of the leather

in its unprepared and prepared state, to be produced to the Society, on or before the last Tuesday in January, 1818.

### BRITISH INDIGO.

94 To the person who shall prepare indigo, or a substance equal to it, from any plants, (except woad) the growth of Great Britain or Ireland, at a price not greater than that of foreign indigo of equal quality, the gold medal or 50 guineas.

A full account of the process and ingredients employed, together with their proportions, and satisfactory *Certificates* that at least one cwt. of the indigo has actually been prepared; also a sample of the same weighing not less than 7 lbs. to be produced to the Society on or before the last Tuesday in January, 1818.

### MINERALOGICAL COUNTY MAPS.

96. To the person who shall complete and publish the best mineralogical map of any county in the united kingdom, on a scale of not less than one inch to a mile, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced, with sections of the strata; the gold medal, or fifty guineas.

*Certificates* of the accuracy of such maps, together with the maps, to be produced to the Society on or before the first Tuesday in February, 1818. The Maps to remain the property of the Society.

### MINERALOGICAL MAP OF IRELAND.

97. To the person who shall complete and publish an accurate mineralogical map of Ireland, on a scale of not less than five miles to an inch, containing particulars described in the foregoing premium; the gold medal, or fifty guineas.

### MINERALOGICAL MAP OF SCOTLAND.

98. The same premium is offered for a mineralogical map of Scotland, on similar conditions.

### NATURAL HISTORY.

99. To the author who shall publish, in the year 1817, the natural history of any county in the United Kingdom; the gold medal, or fifty guineas.

It is required that the several natural productions, animal, vegetable, and mineral, peculiar to the county, or found therein, be carefully and scientifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. The work to be delivered to the Society on or before the last Tuesday in January, 1818, and a copy to be the property of the Society.

## PREMIUMS IN POLITE ARTS.

### HONORARY PREMIUMS FOR PAINTINGS OR DRAWINGS BY NOBILITY.

99. For the best original painting or drawing of any kind, by young gentlemen under the age of twenty-one, sons or grandsons of peers or peeresses in their own right, of Great Britain or Ireland; the gold medal.

100. For the best copy, on similar conditions; the silver medal.

101. For the best original painting or drawing, of any kind, by young ladies under the age of twenty-one; daughters or grand-daughters of peers and peeresses in their own right, of Great Britain or Ireland; the gold medal.

102. For the best copy, on similar conditions; the silver medal.

### HONORARY PREMIUMS FOR PAINTINGS OR DRAWINGS BY GENTLEMEN.

103. For the best original painting or drawing of any kind, by young gentlemen under the age of twenty-one; the gold medal.

104. For the best copy, on similar conditions; the silver medal.

105. For the best original painting or drawing of any kind, by young ladies under the age of twenty-one; the gold medal.

106. For the best copy, on similar conditions; the silver medal.

*N. B.* As the foregoing honorary premiums are intended only for such of the nobility and gentry as may hereafter become patrons or patronesses of the arts; persons professing any branch of the polite arts, or any business dependent on the arts of design, or the sons and daughters of such persons, will not be admitted candidates in the above classes, from 99 to 104 inclusive.

107. For the best original historical painting or drawing, by persons of either sex, under the age of twenty-five; the gold medal.

108. For the best copy of an historical painting or drawing, by persons of either sex, under the age of twenty-one; the silver medal.

109. For the best original landscape, in oil, by persons of either sex, under the age of twenty-five; the gold Isis medal.

110. For the best original landscape in water colours, by persons of either sex, under the age of twenty-one; the silver medal.

111. For the best copy of a landscape, by persons of either sex, under the age of eighteen; the silver Isis medal.

112. For the best original painting or drawing of fruit or flowers, by persons of either sex, under the age of twenty one; the silver medal.

113. For the best finished drawing of the Theseus of the Elgin collection in the British Museum; the size of the drawing not less than eighteen inches high, by persons of either sex under the age of twenty-one; the silver medal.

114. For the best finished drawing of the head of Homer, marked No. 33, in the British Museum, not less than twelve inches in height, by persons of either sex, under the age of 21; the silver medal.

## DRAWINGS OF OUTLINES.

115. For the best outline, after the plaister cast of the Farnese Hercules, by persons of either sex, under the age of 21, the figure not less than eighteen inches; the silver medal.

## MISCELLANEOUS.

116. For the best perspective drawing of machines, by persons of either sex, under the age of twenty-one; the silver medal.

117. For the best original painting or drawing, not included in any of the above mentioned classes, by persons of either sex, under the age of 25; the gold Isis medal.

118. For the best copy, as above, by persons under the age of 21; the silver Isis medal.

## ARCHITECTURAL DESIGNS.

119. For the best original design of a building suited for a General Post Office, on the site of St. Martins le Grand, in the city of London, consisting of plan, elevation, and section, each to be the size of double elephant; the drawing to remain the property of the Society; the gold medallion.

For the next in merit, the silver medallion, on similar conditions.

The following inscriptions to be engraved on these medallions; *The Premium given by the Society for the Encouragement of Arts, Manufactures, and Commerce, in conformity to the Will of John Stock, Esq. of Hampstead.*

## MODELS.

120. For the best original model of a group, not less than three figures, by persons under twenty-five; the gold medal.

For the next in merit, the gold Isis medal.

121 For a single figure, by persons under twenty one, the silver medal.

*** The Model to be baked or cast in plaister, and a cast from the model in each case to remain the property of the Society, if required.

## ETCHING OF AN HISTORICAL SUBJECT.

122. For the best free etching in historical composition, from a picture of eminence; the gold Isis medal.

## ETCHING OF A LANDSCAPE.

123. For the best free etching in landscape composition, from a picture of eminence, the silver medal.

## HISTORICAL ENGRAVING.

124. For the best finished engraving in historical composition; the gold medal.

## LANDSCAPE ENGRAVING.

125. For the best finished engraving in landscape composition; the gold Isis medal.

## ENGRAVING OF A PORTRAIT.

126. For the best finished engraving of a portrait; the gold Isis medal.

N.B. In the class of finished engravings the Society require an aqua-fortis impression, and a finished proof to be sent, and to remain with the Society.

## ENGRAVING ON WOOD BLOCKS.

127. For the best engraving on wood blocks of an historical subject, the size of the principal figure not less than six inches in height, and the block to be at least twelve inches by nine; the gold Isis medal.

Two or more impressions, with the block, to be produced to the Society. The impressions, but not the block, to remain the property of the Society.

## MEDAL DIE ENGRAVING.

128. For the best die engraving, either of a single figure or group, after the engraver's own design and model; the gold medal.

129. For the best die engraving of a design appropriate to the Society's rewards, in the classes either of Mechanics, Chemistry, or Colonies and Trade. The size of the die not to exceed two inches; the gold medal.

The dies, with two impressions or casts and the model, in each claim for medal die sinking, are to be produced to the Society, and the impressions or casts to remain the property of the Society, but the dies to be returned, unless the Society should purchase them.

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## CONDITIONS FOR THE POLITE ARTS.

All articles in the class of Polite Arts, whether for claims or bounties, are to be

produced to the Society on or before the first Tuesday in March, 1818, and none can be received after that day.

No person having received a premium or bounty, shall afterwards receive an equal or inferior one in the same department of art. No candidate shall receive more than one premium in one year.

No more than one performance in any class shall be received from the same candidate.

All performances to which premiums or bounties are adjudged shall remain with the Society until after the second Wednesday in June, 1818, when they will be redelivered, unless mentioned in the Premiums to the contrary.

No performance shall be admitted, that has obtained a reward from any other society, or academy, or has been offered for that purpose.

It is required, that the subjects for which premiums are offered, be delivered in without the names, or any external intimation to whom they belong; that each particular subject be marked in what manner the claimant thinks fit, such claimant sending with it a paper sealed up, having on the *outside*, a corresponding mark, and the age and sex of the claimant, together with the number of the class in which it is meant that the claim should be made, and on the *inside*, the claimant's name, residence, and age; the name not to be disclosed, unless the candidate be successful, or by a special vote of the Society. No production can be received with a view to obtain a bounty, which could have come into any of the foregoing classes.

To encourage real merit, and to prevent attempts to impose on the Society by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate, to be made under the inspection of the Committee of Polite Arts.

All candidates in the Polite Arts are required to signify, on their drawings, whether the performances are originals or copies; and if possible to send the originals from which copies are taken.

All copies of drawings, &c. are to be on a different scale from the original.

The Society reserve to themselves the power of giving in all cases such part only of any premium as the performance shall be judged to deserve; or of withholding the whole, if there be no merit.

# PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

## EMPLOYMENT OF FEMALES.

130. To the person who shall instruct and employ the greatest number of females, not fewer than twenty, in the making of men's clothes, particularly of woollen cloth, and not being for the use of the army or navy; the gold medal, or fifty guineas.

*Certificates* that the number of women above mentioned have been constantly so employed for at least three months, to be produced to the Society on or before the last Tuesday in March, 1818.

131. For the next greatest number of women so employed, not fewer than ten; the silver medal, or fifteen guineas, on similar conditions.

## CLOTH FROM HOP-STALKS, NETTLES, &c.

132. To the person who shall produce to the Society the greatest quantity, not less than thirty yards, of cloth, at least 27 inches wide, made in Great Britain or Ireland, of hop-stalks or bines, nettles, or other raw vegetable substances, the produce of Great Britain or Ireland, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as cloth of equal quality and appearance now made from hemp, flax, or cotton, and much finer in quality than any hitherto manufactured in England from hop-stalks, &c.; the gold medal, or thirty guineas.

One pound of the thread of which the cloth is made, and thirty yards of the cloth together with proper *certificates* that the whole is manufactured from hop-stalks, or bines, &c. to be produced to the Society on or before the last Tuesday in December, 1817.

N. B. The Society is already in the possession of cloth made in England from hop-stalks or bines, and nettles, which may be inspected by application to the House-keeper.

## SHEEP'S WOOL.

133. To the person who shall prove to the Society, that he has sold the largest quan-

tity of Merino wool, or such wool as will answer the same purpose, being the produce of his own flock, in the United Kingdom, for the purpose of being manufactured into superfine cloth, the quantity of wool not less than five hundred weight, in the year 1817; the gold medal.

*Certificates*, along with samples of the wool, and of the cloth manufactured from it, to be produced to the Society on or before the last Tuesday in March, 1818.

133. For the next greatest quantity, not less than two hundred and fifty pounds; the silver medal, on similar conditions.

## WICKS FOR CANDLES OR LAMPS.

134. To the person who shall discover to the Society, a method of manufacturing hop-stalks or bines, nettles or any other cheap material, the growth of the United kingdom, so as to render them equally fit for the purpose of supplying the place of cotton, for wicks of candles or lamps; the silver medal or twenty guineas.

Samples, not less than 5 lbs. weight, of the wicks so prepared, to be produced to the Society on or before the last Tuesday in December, 1817, with *certificates* that the whole quantity is equal in quality to the sample.

## EXPERIMENTS TO ASCERTAIN THE PROPER THICKNESS OF WICKS FOR CANDLES.

135. To the person who shall make known to the Society the most satisfactory result of a series of experiments actually made by him to determine the best thickness of cotton wicks for candles, so as to obviate the defects of those commonly used; the silver medal, or ten guineas.

*Certificates* that not less than one hundred weight have been so made, and six pounds of the candles, to be produced to the Society, on or before the last Tuesday in February, 1818.

N.B. The intention in offering this premium, is to ascertain the proper thickness or bulk of the wick in proportion to that of the tallow, and to remove the unpleasant consequences and waste arising from the sparkling, or guttering of the candles in common use.

## PAPER FROM RAW VEGETABLE SUBSTANCES.

136. To the person who shall, between the first of January, 1817, and the first of January, 1818, make the greatest quantity, and of the best quality, (not less than ten reams) of good and useful paper, from raw vegetable substances, the produce of Great Britain or Ireland, and which have not been used in manufacturing paper previous to January, 1815, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as paper of equal quality and appearance now made from rags; the silver medal, or twenty guineas.

N.B. The object of the Society being to add to the number and quantity of raw materials used in this manufacture, it is their wish to include every useful sort of paper, and to introduce such natural products as can be easily and cheaply procured in great quantities. The Society are in possession of two volumes containing a great variety of specimens of paper made from raw vegetable substances, viz. nettles, potato-haulm, poplar, hop-bines, &c. which volumes may be inspected by any person on application to the Housekeeper.

*Certificates* of the making such paper, and one ream of the paper, to be produced on or before the second Tuesday in January, 1818.

## TRANSPARENT PAPER.

137. To the person who shall discover to the Society a method of making paper from the pulp, that shall be perfectly transparent, and of a substance and body equal to foolscap, that shall take and bear common writing-ink with the same facility and correctness as writing-paper generally in use; the silver medal, or twenty guineas.

*Certificates* of the making such paper, an *account* of the process, and one ream of the paper, to be produced on or before the second Tuesday in January, 1818.

(INDIA PAPER, see page 25.)

## CHINTZ PATTERNS FOR CALICO-PRINTERS.

138. For the best original pattern in a new taste, of light and dark-ground chintz for garment work, or furniture, fit for the purpose of calico-printers, by persons of either sex; the silver medal. The pattern for which the premium is adjudged, to remain the property of the Society.

## COPPER-PLATE PATTERNS FOR CALICO-PRINTERS.

139. For the best pattern, in a new style, fit for the purpose of calico-printers for garment-work or furniture; the silver medal. The pattern for which the premium is adjudged, to remain the property of the Society.

*N.B.* The patterns to be produced on or before the last Tuesday in February, 1818.

## GLOVES EQUAL TO FRENCH KID.

140. To the person who shall make known to the Society, a process equal to that of the French, or a superior one, for preparing, dyeing, and finishing the skins, verified by actual experiments, and the communication

accompanied with at least a dozen pair of gloves made from skins so prepared in an equal or superior manner; the gold medal, or forty guineas.

*Certificates* from competent persons, fully approving of the result of such experiments, together with the gloves and communication, to be produced to the Society on or before the last Tuesday in March, 1818.

### IMPROVED CAT-GUT EQUAL TO ROMAN OR ITALIAN.

To the person who shall discover to the Society the best method of manufacturing, in the United Kingdom of Great Britain and Ireland, the intestines of sheep, lambs, goats, or of any other animals, into the article called cat-gut, equally strong, clear, smooth, even, and free from knots, as the best Italian strings, and at a price not exceeding what they are usually sold for in England; the gold medal, or thirty guineas.

*Certificates* that not less than fifty pounds weight have been so prepared by the claimant, with a full detail of the process, and samples of the articles of various thicknesses, to be produced to the Society on or before the first Tuesday in February, 1818.

142. For the next greatest quantity, not less than twenty-five pounds; the silver medal, or twenty guineas, on similar conditions.

### MAKING HOSE FOR THE USE OF FIRE ENGINES, BREW-HOUSES, &c.

143. To the person who shall invent a method of making hose for fire engines, brewhouses, &c. similar to those used on the Continent, made of flax or hemp, or other flexible material cheaper than leather; the gold Isis medal, or thirty guineas.

A full *account* of the process used in manufacturing it, with *certificates* of its efficacy in practice, to be produced to the Society on or before the last Tuesday in February, 1818.

### THREAD FOR LACE.

144. To the person who shall invent or discover a method of manufacturing thread from flax, for the making of lace, of as fine quality as any used on the continent; the gold medal, or thirty guineas.

Samples of the thread, not less than one pound in weight, and of the lace made therefrom, together with *certificates* that not less than ten pounds in weight of each sort has been manufactured, to be produced to the Society, on or before the last Tuesday in March, 1818.

## PREMIUMS IN MECHANICS.

### GUNPOWDER MILLS.

145. To the person who shall invent and bring to perfection the most effectual method of so conducting the works of gunpowder mills in the business of making gunpowder, as to prevent explosion; the gold medal, or one hundred guineas.

*Certificates* and *accounts* of the method having been put in practice in one or more gunpowder mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in Feb. 1818.

*N.B.* As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder making which fall short of the total prevention of explosion, and they are sent to the Society for the sake of humanity, the papers so sent in will receive due consideration; and such bounty or reward will be bestowed as they may appear to merit.

### TRANSIT INSTRUMENTS.

146. To the person who shall invent and produce to the Society a cheap and portable transit instrument which may easily be converted into a zenith sector, capable of being accurately and expeditiously adjusted for the purpose of finding the latitudes and longitudes of places, and superior to any portable transit instrument now in use; the gold medal, or forty guineas.

To be produced on or before the last Tuesday in January, 1818.

### TAKING WHALES BY THE GUN-HARPOON.

147. To the person who shall strike and take the greatest number of whales, not fewer than three, with the gun-harpoon; ten guineas.

*Certificates* of the striking such whales, and that they were actually taken in the

year 1817, signed by the master, or by the mate when the claim is made by the master, to be produced to the Society on or before the last Tuesday in December, 1817.

148. *This Premium is extended one year further, on similar conditions.*

## FAMILY MILL.

149. To the person who shall invent and produce to the Society the best constructed mill for grinding corn for the use of private families, or parish poor; the construction to be such as to render the working of the mill easy and expeditious, and superior to any hitherto in use; the gold medal or thirty guineas.

The mill, and *certificates* of its having been used to good effect, to be produced to the Society on or before the first Tuesday in February, 1818. Cheapness and simplicity will be considered as essential parts of its merit; and the mill, or a model, to remain with the Society.

## A PORTABLE MILL FOR GRINDING CORN.

150. To the person who shall invent and produce to the Society a portable corn mill, superior to any now in use; the gold Isis medal, or thirty guineas.

The mill, and *certificates* of its efficacy from actual use, to be produced to the Society on or before the last Tuesday in February, 1818.

## A PORTABLE OVEN.

151. To the person who shall invent and produce to the Society a portable oven, superior to any hitherto in use; the silver medal, or twenty guineas.

The oven, with *certificates* that it has been found to answer in use, to be produced to the Society on or before the last Tuesday in February, 1818.

## MACHINE FOR RAISING COALS, ORE, &c. &c.

152. To the person who shall invent a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use; and which shall produce the effect at a less expense than those already known or in use; the gold medal, or fifty guineas.

A model of the machine, made on a scale of not less than one inch to a foot, with a *certificate* that a machine at large on the same construction has been advantageously used, to be produced to the Society on or before the second Tuesday in Feb. 1818.

## IMPROVED WALKING-WHEEL, OR CRANE.

153. To the person who shall invent an improved walking-wheel or crane, on which the weight or power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less weight to be raised or lowered; the gold medal, or thirty guineas.

The model on a scale of not less than one inch to a foot, with a proper *certificate* that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in February, 1818.

## MACHINE FOR RAISING WATER.

154. To the person who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known or in use for raising water out of wells, &c. from a depth of not less than fifty feet; the gold medal, or thirty guineas.

*Certificates* of the performance of the machine, and a model of it, on a scale of not less than one inch to a foot, to be produced to the Society on or before the first Tuesday in February, 1818.

## EXTINGUISHING FIRES.

155. To the person who shall produce to the Society the best and most effectual method of procuring an immediate supply of water in case of fire, or for the means best calculated to prevent or extinguish accidental fires in buildings, superior to any now in use; the gold medal, or thirty guineas.

*Certificates* of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the second Tuesday in January, 1818.

## BORING AND BLASTING ROCKS.

156. To the person who shall discover to the Society a more simple, safe, cheap, and expeditious method than any hitherto known or in use, of boring or blasting rocks in mines, shafts, wells, &c.; the gold medal, or thirty guineas.

*Certificates* of the methods having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in January, 1818.

## HEATING ROOMS FOR THE PURPOSE OF MANUFACTURERS.

157. To the person who shall invent and discover to the Society a method of heating rooms, superior to any hitherto known or in use, and at a moderate expense, for the purpose of painters, japanners, and other manufacturers, so as to avoid the necessity of iron or copper tunnels going through the rooms to convey the smoke, whereby the danger from such tunnels may be prevented; the gold medal, or thirty guineas.

A model or complete drawing and description of the method, with *certificates* that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1818.

## IMPROVED VENTILATION.

158. To the person who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used; the gold medal, or fifty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates*, to be delivered to the Society on or before the last Tuesday in February, 1818.

## PREVENTING ACCIDENTS FROM HORSES FALLING WITH TWO-WHEELED CARRIAGES.

159. To the person who shall invent and produce to the Society a method, superior to any hitherto known or in use, to prevent accidents from the falling of horses with two-wheeled carriages, especially on steep declivities; the gold medal, or thirty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates* that the same has been used with success, to be delivered to the Society on or before the second Tuesday in January, 1818.

## IMPROVING TURNPIKE AND OTHER ROADS.

160. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiments, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat, or any other mode, so as to form an even, hard, and durable carriage-road; the gold medal, or thirty guineas.

It is required that an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1818.

## RAISING THE BODIES OF PERSONS WHO HAVE SUNK UNDER WATER.

161. To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water; the gold medal, or thirty guineas.

The drag or machine, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in March, 1818.

## FOR PREVENTING PREJUDICIAL EFFECTS TO THE PERSONS EMPLOYED IN POINTING NEEDLES.

162. To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of pointing needles, by grinding them dry, during which the particles of grindstone-dust, and steel, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders; the gold medal, or thirty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, together with proper *certificates* of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1818.

## FOR PREVENTING ACCIDENTS FROM STAGE COACHES.

163. To the person who shall invent and discover to the Society a method or methods for preventing accidents arising from stage coaches; the gold medal, or thirty guineas.

Ample *certificates* of its efficacy, and a description of the method, with models of the machinery used, to be produced to the Society on or before the last Tuesday in February, 1818.

N. B. The Society wish to impress strongly on the public the necessity of turning their attention to the above premium, from the number of accidents that daily occur; and suggest whether they might not in some degree be prevented, by an alteration in the manner of placing the luggage.

## A SUBSTITUTE FOR LEAD PIPES.

164. To the person who shall discover or invent and produce to the Society, a substitute for the lead pipes used for conveying malt and other liquors from the cellars to the bars of public houses; the gold medal, or fifty guineas.

The substance of which the pipe is made must be free from any poisonous or noxious quality, equally durable as lead, and at a moderate expense; and a specimen thereof, not less than ten yards in length, with a complete description of the process employed in forming

it, must be produced to the Society on or before the last Tuesday in February, 1818.

### PREVENTING EXPLOSIONS IN STEAM-ENGINE AND OTHER COVERED BOILERS.

165. To the person who shall invent and discover to the Society a method of rendering steam-engines and other covered boilers safer than any now in use, and less liable to accidents from explosion; the gold medal, and not less than thirty guineas.

Ample *certificates* that the method has been found to answer its intended purpose, to be produced to the society, on or before the last Tuesday in February, 1818.

## PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE.

### TAKING PORPOISES.

166. To the people in any boat or vessel, who, in the year 1818, shall take the greatest number of porpoises on the coast of Great Britain or Ireland, by gun-harpoon, or any other method, not fewer than thirty, for the purpose of extracting oil from them; the gold medal, or thirty guineas.

*Certificates* of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in January 1818.

### OIL FROM PORPOISES.

167. To the person who shall manufacture the greatest quantity of oil from porpoises taken on the coast of Great Britain or Ireland, in the year 1817, not less than twenty tons; the gold medal, or thirty guineas.

*Certificates* of the oil having been made from porpoises actually caught on the coast of Great Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1818.

### CURING HERRINGS.

168. To the person or persons who shall before January, 1818, cure the greatest quantity of white herrings, not less than thirty barrels, equal in all respects to the best Dutch herrings, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port; the gold medal, or fifty guineas.

169. For the next greatest quantity, not less than fifteen barrels; the silver medal, or twenty guineas.

A sixteen-gallon barrel of the herrings to be produced to the Society on or before the first Tuesday in February, 1818, with *certificates*, that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimen, together with a full description of the process employed.

### CURING MACKAREL.

170. To the person or persons who shall, before January, 1818, cure the greatest quantity of mackarel, not less in number than ten thousand, in the best manner and to the satisfaction of the Society, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port; the gold Isis medal, or twenty-five guineas.

171. For the next greatest quantity, not less than five thousand; the silver medal or fifteen guineas.

A sixteen-gallon barrel of the mackarel to be produced to the Society on or before the first Tuesday in January, 1818, with *certificates* that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimens, together with a full description of the process employed.

The same premiums to be extended one year further, on similar conditions.

*N. B.* Specimens of cured mackarel, which promise to afford a most valuable article of trade and food, even superior to herrings, have been sent to the Society, and have induced them to turn the attention of the public thereto, by offering the above premiums.

# PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH COLONIES.

## NUTMEGS.

172. For the greatest quantity of merchantable nutmegs, not less than ten pounds weight, being the growth of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or of the several islands adjacent thereto, and equal to those imported from the islands of the East Indies; the gold medal, or fifty guineas.

Satisfactory *certificates*, from the governor or commander in chief, of the place of growth, with an *account* of the number of trees, their age, nearly the quantity of fruit on each tree, and the manner of culture, to be produced on or before the first Tuesday in January, 1818.

## KALI FOR BARILLA.

173. To the person who shall have cultivated, in the Bahama Islands, or any other part of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, in the year 1816, the greatest quantity of land, not less than two acres, with Spanish kali fit for the purpose of making barilla; the gold medal, or thirty guineas.

174. For the next greatest quantity, not less than one acre; the silver medal, or fifteen guineas.

*Certificates*, signed by the governor or commander in chief for the time being, of the quantity of land so cultivated, and of the state of the plants at the time of signing such *certificates*, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in January, 1818.

## DESTROYING THE INSECT COMMONLY CALLED THE BORER.

175. To the person who shall communicate to the Society an effectual method of destroying the insect commonly called the borer, which has of late years been so destructive to the sugar canes in the West India islands; the gold medal, or fifty guineas.

The discovery to be ascertained by satisfactory *certificates*, under the hand and seal of the governor or commander in chief for the time being, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied; such *certificates* to be delivered to the Society on or before the first Tuesday in January, 1818.

## CULTIVATION OF HEMP IN UPPER CANADA.

176. To the person who shall sow with hemp the greatest quantity of land in the province of Upper Canada, not less than six arpents (each four-fifths of a statute acre), in the year 1816, and shall at the proper season cause to be plucked the summer hemp (or male hemp bearing no seed), and continue the winter hemp (or female hemp bearing seed), on the ground until the seed is ripe; the gold medal, or one hundred dollars.

177. To the person who shall sow with hemp the next greatest quantity of land in the same province of Upper Canada, not less than five arpents, in the year 1816, in the manner above mentioned; the silver medal, or eighty dollars.

178. For the next greatest quantity of land, in the same province, and in a similar manner, not less than four arpents; sixty dollars.

179. For the next greatest quantity of land, in the same province, and in a similar manner, not less than three arpents; forty dollars.

180. For the next greatest quantity of land, in the same province, and in a similar manner, not less than one arpent; twenty dollars.

*Certificates* of the number of arpents, the method of culture, of the plucking of the hemp, with a general *account* whether sown broad-cast or in drills, the expense, soil, cultivation and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, together with 28lb. of the hemp, and two quarts of the seed, on or before the last Tuesday in April, 1818.

### CULTIVATION OF HEMP IN LOWER CANADA.

181 to 185. Premiums exactly similar in all respects to those held out for the province of Upper Canada, are also offered for the province of Lower Canada.

### CULTIVATION OF HEMP IN NOVA SCOTIA AND NEW BRUNSWICK.

186 to 190. Similar premiums in all respects are also offered to the provinces of Nova Scotia and New Brunswick.

### IMPORTATION OF HEMP FROM CANADA, NOVA SCOTIA, AND NEW BRUNSWICK.

191. To the master of that vessel which shall bring to this country the greatest quantity of marketable hemp, not less than one hundred tons, in the year 1817, the produce of Upper Canada, or of one of the above mentioned provinces; the gold medal.

192. To the master of that vessel which shall bring the next quantity, not less than fifty tons; the silver medal.

*Certificates*, satisfactory to the Society, to be produced by the master of the vessel on or before the first Tuesday in February 1818, to testify that such hemp was grown and prepared in Canada, Nova Scotia, or New Brunswick.

### SUBSTITUTE FOR HEMP.

193. To the person who, in year 1817, shall discover and produce to the Society a substitute for hemp, equally cheap, durable, and applicable to all the purposes for which hemp is now used; the gold medal, or fifty guineas.

A quantity of the substitute, not less than one hundred weight, together with the proper *certificates* from the governor or commander in chief, if raised in any of the British colonies, or from the Secretary of the Board of Trade, if raised in the East Indies, to prove that the same has been used with success, to be produced to the Society on or before the last Tuesday in February, 1818.

*N. B. The premiums for Nos.* 172, *to* 189, *are all extended one year further, on similar conditions.*

### SILK.

194. For the greatest quantity of silk proper for manufactures, not less than one hundred pounds weight, produced by any person in the Isle of France, or in Malta, or islands near or adjacent thereto, in the possession of Great Britain, in the year 1816, from silk-worms bred there the gold medal, or fifty guineas.

Specimens of the silk, not less than one pound, with an *account* of the method in which the silk-worms were managed; the kind and size of the mulberry-trees from whence they were furnished with food, and particulars respecting the culture of the mulberry-trees for that purpose, to be produced to the Society on or before the first Tuesday in March, 1818.

195. For the next greatest quantity not less than fifty pounds, on similar conditions; the silver medal, or twenty guineas.

Satisfactory *certificates* from the governor or commander in chief of the district where the said silk was produced, and of the several particulars above mentioned, to be delivered to the Society along with the samples required.

*N.B.* The same premiums, on similar conditions, will be given for silk produced in the years 1817 and 1818,

## PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH SETTLEMENTS IN THE EAST INDIES.

### INDIA PAPER FOR COPPER PLATE PRINTING,

195. To the person who shall communicate to the Society the best account of the process employed in India in the manufacture of paper used in England for copper-plate printing, and known by the name of India paper, together with an account of the materials from which such paper is made; the gold medal, or 50 guineas.

*Specimens* of the paper, not less than two reams, with samples of the materials in their raw or unmanufactured state, and satisfactory *certificates* signed by the Secretary of the Board of Trade of the respective settlement, to be produced to the Society on or before the first Tuesday in March, 1820.

### BHAUGULPORE COTTON.

196. To the person who shall import into the port of London, in the year 1817, the greatest quantity, not less than one ton, of the Bhaugulpore cotton, from which

cloths are made in imitation of nankin, without dyeing; the gold medal.

A quantity of the cotton, not less than five pounds weight, in the pod, and five pounds carded, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of Bengal or Bombay, on or before the last Tuesday in February, 1818.

### ANNATTO.

197. To the person who, in the year 1817, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of annatto, not less than five hundred weight; the gold medal.

A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in Feb. 1818.

### TRUE COCHINEAL.

198. To the person who, in the year 1814, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of true cochineal, not less than three hundred weight; the gold medal.

A quantity of the cochineal, not less than three pounds weight, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1818.

*N.B. The Premiums from No.* 192 *to* 194 *inclusive, are all extended two years further, on similar conditions.*

## GENERAL CONDITIONS.

AS the great object of the Society in rewarding individuals is to draw forth and give currency to those inventions and improvements, which are likely to benefit the public at large, candidates are requested to observe, that if the *means*, by which the respective objects are effected, require an expense or trouble too great for *general purposes*, the Society will not consider itself bound to give the offered *reward*; but, though it thus reserves the power of giving in all cases such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims.

All candidates are to take notice, that no claim for a premium will be attended to, unless the conditions are fully complied with.

The models of all machines, which obtain premiums or bountics, shall be the property of the Society.

The Premiums of this Society are designed for the United Kingdom, unless expressly mentioned to the contrary.

The claims will be determined as soon as possible after the delivery of the specimens.

It is expected that all articles for claims or bounties be sent to the Society, carriage paid.

No person shall receive any premium, bounty, or encouragement, from the Society, for any matter for which he has obtained or purposes to obtain, a patent, or for which he has obtained any premium or reward from any other Society.

A candidate for a premium, or a person applying for a bounty, being detected in any disingenuous method to impose on the Society, shall forfeit such premium or bounty, and be deemed incapable of obtaining any for the future.

No member of this Society shall be a candidate for, or entitled to receive, any premium, bounty, or reward whatsoever, except the honorary medal of the Society. The candidates are, in all cases, expected to furnish a particular account of the subject of their claims; and where certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the respective advertisement, and be signed by disinterested persons who have a positive knowledge of the facts stated.

Where premiums or bounties are obtained in consequence of specimens produced, the Society mean to retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No candidate, not a member, shall be present at any meeting of the Society or Committees, or admitted at the Society's rooms, after they have delivered in their claims, until such claims are adjudged, unless summoned by the Committee.

The Society, anxious to promote the Arts of their country, have adopted the resolution of forming a Collection of Prints, to be open for public inspection; and, having arranged those already in their possession, invite engravers to send etched or finished proofs of their plates; and hope that amateurs, collectors, and publishers of works of art, will also contribute to the undertaking.

Prints of machines, or maps, will also come within this arrangement.

This Society further invite the communications of scientific and practical men, upon all subjects connected with the views of this Society, although their experiments may have been conducted upon a smaller scale than the terms required by the premiums; as such communications may afford ground for more extensive application, and thus materially contribute to the advantage of the public.

The Library of the Society, which has already become very valuable, may yet receive considerable additions and improvements from the presents of members, or other persons who may be inclined to place useful books or valuable manuscripts in a repository at once permanent and conducive to the national benefit.

All communications are to be made by letter, addressed to ARTHUR AIKIN, Esq. the Secretary, *at the Society of Arts, &c. Adelphi, London.*

And where articles are sent by Sea for the Society, the Bills of Lading are to be addressed to the care of WILLIAM VAUGHAN, Esq. *Mincing-lane, London,* who has undertaken to receive them for the Society.

The Winchester bushel is the measure referred to for grain; and, as the acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute Acres of five and a half yards to the rod or pole, and they request that all communications to them may be made agreeably thereto.

*The Society desire that the Papers on different subjects sent to them may be full, clear, and explicit, fit for publication; and that descriptive Drawings may be sent, with the Models and Machines laid before the Society.*

*** To persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose.

*Item.* I give and bequeath to A. B. and C. D. the sum of upon condition and to the intent that they, or one of them, do pay the same to the Collector, for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures and Commerce; which said sum of I will and desire may be paid out of my personal estate, and applied towards the carrying on the laudable designs of the Society.

## BRITISH MARBLES.

*N. B. The Society considering that it would be beneficial to the Commerce of the United Kingdom to bring the British Marbles into general use, and that the most effectual method of accomplishing their object would be,* for the present, *to make them more generally known in the Capital, have come to the following resolution:*

Resolved, That specimens of British Marbles be exposed in the Society's Rooms, in the Adelphi, for the inspection of the public, under the following regulations:

1st, That all the specimens be exact to a given size, viz. eight inches high, six inches broad, one thick, and polished on one face.

2d, That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name of the parish were situated, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

As the exertions of the Society can be generally beneficial only inasmuch as their views are seconded by the public, the Society request, that all proprietors of marble quarries will favour them with a specimen of the marble, worked to the exact size above mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public. By such arrangements, it is expected that the interest of the proprietors of the quarries will be promoted, and the use of British marble much extended. A variety are already exhibited in the Society's Rooms.

*The Society take this opportunity of returning their thanks to the several Societies and individuals who have favoured them with Presents for their Repository and Library.*

# PREMIUMS AND REWARDS

BESTOWED BY THE

# *Society of Arts, Manufactures, and Commerce,*

# ADELPHI,

DURING THEIR SESSION,

WHICH COMMENCED ON THE FIRST WEDNESDAY IN NOVEMBER, 1816,
AND CLOSED ON THE EIGHTEENTH OF JUNE, 1817.

On Tuesday, May 27, 1817,
His Royal Highness the DUKE of SUSSEX, President,
distributed the Rewards then adjudged.

## IN AGRICULTURE.

No. 1. To Mr. C. Essex, East Acton, Middlesex, for a machine for cleaning Corn, the Gold Ceres Medal.

2. To J. Lawson Esq. Old Mill, near Elgin, for planting 212 Acres, with 985,300 Forest Trees, the Gold Medal.

3. To the Earl of Jersey, for embanking 300 Acres of Land, on the Gnoll and Britton Ferry Marshes, the Silver Isis Medal.

4. To Henry Grant, Esq. for embanking 300 Acres of Land, on the Gnoll and Britton Ferry Marshes, the Silver Isis Medal.

5. To Mrs. H. D'Oyley, Red Car, near Gisborough, for the culture of Bull rushes (Scirpus Lacustris,) for the use of Chair Makers, the Silver Medal.

## IN CHEMISTRY.

1. To Mr. James Callender, King's Head Court, Holborn, for a method of Seasoning Mahogany, Fifteen Guineas.

2. To Mr. T. Stiles, Norwich, for a method of preparing an extract from Sprats, the Silver Medal and Ten Guineas.

3. To Mr. R. Wynn, Wellington Place, Vauxhall, for Receipts for Enamel Colours, and for staining and gilding glass, Twenty Guineas.

## IN POLITE ARTS.

1. To Mr. W. C. Ross, Upper Charlotte Street, Fitzroy Square, for an original historical painting, *the Judgment of Brutus*, the gold Medal.

2. To Mr. J. H. Marvin, Duke Street, Manchester Square, for an Original painting of the interior of King Henry the Seventh's Chapel, the Gold Isis Medal.

3. To Mr. H. Harriot, West Hall, Mortlake, Surry, for an original landscape in oil, the Gold Isis Medal.
4. To Mr. G. Maile, Frederick Place, Hampstead Road, for an engraving of a portrait, the Gold Isis Medal.
5. To Miss Emma Eleonora Kend ick, Upp·r Mary-le-bone Street, for an original historical miniature, the Gold Isis Medal.
6. To Mr. G. Mills, Hadlow Street, Burton Crescent, for a Medal die, the Gold Isis Medal.
7. To Miss Cotton, Chichely, Newport Pagnel, for an original drawing of Flowers, the Silver Medal.
8. To Mr. Thomas Merrifield, Princes Street, Bedford Row, for an original model of one figure, the Silver Medal.
9. To Miss Smith, Cirencester Place, Fitzroy Square, for a drawing in water colours, the Silver Medal.
10. To Mr. J. Carver, Great Russel Street Bloomsbury, for a drawing on charred wood, the Silver Medal.
11. To Miss Mary Anne Say, Norton Street, Fitzroy Square, for a drawing, the Silver Medal.
12. To Master. J. G. Barlace, Frith Street, for a drawing, a portrait, *executed with the left hand*, the Silver Medal.
13. To Miss Eliza Phillipps, Wandsworth Road, for an Original Landscape, the Silver Medal.
14. To Miss Dutton, *(now Mrs. Pearson,)* Great St. Helens, for an original Oil painting, the Silver Medal.
15. To Mrs. M. A. Warren. Glasgow, for a Piano Monitor, the Silver Medal.
16. To Mr. J. C. Mead, Charlotte Street, Fitzroy Square, for an original Architectural drawing, the Silver Medalion, in conformity to the Will of the late John Stock, Esq. of Hampstead.
17. To Mr. C. F. Taylor, Leadenhall Street, for a drawing, the Silver Isis Medal.
18. To Miss, Smith, East Street, Red Lion Square, for a chalk drawing, the Silver Isis Medal.
19. To Miss Eliza Wallace, Bath, for a drawing of fruit and flowers, the Silver Isis Medal.
20. To Mr. A. Harrison, Camden Town, for an original painting of a Parrot, the Silver Isis Medal.
21. To Miss E. M. Hunter, Birmingham, for an original drawing, the Silver Isis Medal.
22. To Miss M. Tomkins, New Bond Street, for a chalk drawing, from Rubens, the Silver Isis Medal.
23. To Miss C. H. Evatt, Wandsworth, for an original Landscape, the Silver Isis Medal.
24. To Mr. C. Smith. Norton Street, Fitzroy Square, for an original model of one figure, the Silver Isis Medal.
25. To Master S. Hanning, Glass house Street, Piccadilly, for an Intaglio, the Silver Palette.
26. To Mr. J. Monroe, Adelphi Terrace, for a drawing, the Silver Palette.
27. To Miss Nonnen, James Street, Buckingham Gate, for an original portrait, the Silver Palette.
28. To Miss M. Mainwaring, Chancery Lane, for a chalk drawing, the Silver Palette.
29. To Mr C. Robinson, Devonshire Square, Mary-le-bone, for a chalk drawing, the Silver Palette.
30. To Miss Cook, Rotherithe Street, for a drawing, the Silver Palette.
31. To Master W. Powis, Pentonville, for a drawing, the Silver Palette.
32. To Mr. Blanchard, Queen Street, Lincoln's inn fields, for a pen and Ink drawing, the Silver Palette.
33. To Mr. F. R. Say, Norton Street, Fitzroy Square, for a drawing, the Silver Palette.
34. To Miss Leonora Say, Norton Street, Fitzroy Square, for a drawing, the Silver Palette,
35. To Mr. W. Edwards, Goswell Street Road, for an outline drawing the Silver Palette.
36. To Mr. W. Watts, Northampton Square, for an outline drawing, the Silver Palette.
37. To Mr. F. Rock, Birmingham, for an engraving of a portrait, the Silver Medal.
38. To Mr. D. Dick, Vauxhall Walk, for an Instrument for drawing in perspective, the Silver Medal.

## IN MANUFACTURES.

1. To Mr. T. Saddington, Shadwell, for a machine for covering wire with silk or thread, Fifteen Guineas.

## IN MECHANICS.

1. To Mr. Conolly, Rolls Buildings, for a Telegraphic Dictionary, the Gold Isis Medal.
2. To Mr. Jones, Holborn, for a self adjusting Crane, the Gold Isis Medal.

3. To Mr. William Wynn, Farnham, for a Time keeper and compensating Pendulum, the Gold Isis Medal, and Twenty Guineas.
4. To Mr. R. Onwin, Oxford Street, for a Banding Place, the Silver Isis Medal, and Five Guineas.
5. To Mr. Farnham, Borough, for a Steam Trap. the Silver Isis Medal, or Five Guineas.
6. To Mr. G. Preston, Burr Street, Wapping, for a portable Deck Glass, and Ventilator, the Silver Medal.
7. To Dr. Davis, Charlotte Street, Bloomsbury, for a Craniotomy forceps, the Gold Medal.
8. To Mr. W. Burchard, Waddon, near Croydon, for a Cylindrical traversing rake, the Silver Medal.
9. To Mr. C. Wilson, Union Street, Borough, for a machine for sweeping chimnies. Ten Guineas.
10. To Mr. W. Aust, Grays-Inn-Road, for a machine for Freeing the shaft horse, when fallen with a loaded cart, the Silver Medal, and Fifteen Guineas.
11. To Mr. W. Warcup, Dartford, Kent, for a Curvagraph, the Silver Medal and Ten Guineas.
12. To Capt. G. Bray, Charmouth, for a life Boat, the Silver Medal.
13. To Mr. J. Prior, Nessfield, near Skipton, for the striking part of a Clock, the Silver Isis Medal and Twenty Guineas.
14. To Mr. F. Coad, Drury Lane, for a machine to enable shoemakers to work standing, Ten Guineas.
15. To Mr. George Wood, Chapel Street, Curtain Road, for a Parallel rule, the Silver Medal or Ten Guineas.
16. To Mr. William Hall, Lambeth, for an instrument for Laying down angles, the Silver Medal and Ten Guineas.
17. To Mr. W. Caslon, Salisbury Square, Fleet Street, for an improved Gas Lamp, the Silver Medal.

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*** Since the public Distribution, the following Medals have been awarded by the Society.

1. To W. R. Clanny, M. D. Bishops Wearmouth, Durham, for a steam safety lamp; the gold medal.
2. To Mr. Joseph Farey, junr. Howland Street, for a Double ball cock, the Silver Isis medal.

*** *The Public are requested to guard against impositions, from persons Advertising, or pretending to have Patents for Articles rewarded by the Society. It is a stipulated condition, that all Persons who receive Premiums or Bounties from the Society, shall relinquish all Pretensions to a Patent for Articles so rewarded, and shall allow them to be made by any Person whatever.*

*The Public are also cautioned against purchasing Articles sold under a pretended sanction of the Society's Name. Information may be had, by inquiry at the Society's House, whether the advertised Articles are, or are not, Deceptions upon the Public.*

*** Since the last Distribution of Rewards, TWO HUNDRED New Members have been elected.

The LIST OF PREMIUMS offered, may be had *gratis*, at the Society's House, in the Adelphi. By Order of the Society,

*June*, 1817. ARTHUR AIKIN, Secretary.

N.B. Where errors have arisen in the address of any Member of the Society, information is desired to be given to Mr. R. Elwin, the Collector, at the Society's House, in the Adelphi, who receives the Subscriptions from the Members, and furnishes Receipts for the same.

*Lately was published, Price* 10*s.* 6*d.*

THE THIRTY-FOURTH VOLUME of the SOCIETY'S TRANSACTIONS, which may be had from the Housekeeper, at the Society's House, in the Adelphi. Also complete Sets of their Transactions, or any single Volume.

Also, An ANALYTICAL INDEX of the FIRST TWENTY-FIVE VOLUMES of the TRANSACTIONS of the SOCIETY, to the termination of their Session, June, 1807, price 5s. With a list of the Machines and Models in the Society's Repository, to the year 1813, inclusive.

A CATALOGUE of BOOKS in the Society's Library, may be procured as above, price One Shilling, with an Appendix thereto.

# PAPERS

IN

# AGRICULTURE.

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*The* GOLD MEDAL *of the Society was this Session presented to* J. LAWSON, *Esq. of Old Mill, near Elgin, for planting* 212 *Acres with* 985,300 *Forest Trees. The following Communication was received from him on the subject.*

SIR,

I BEG leave to submit the following statement to the Society for the Encouragement of Arts, &c., and should feel very grateful if what I have done should be found to merit the Premium, offered by the Society in 1813, for *Forest Trees.*

In June, 1813, I purchased a small property, called *Chappletown*, situated in the parish of *Drumblade*, in the inland part of *Aberdeenshire*, and consisting of 242 acres, arable; 80 of green pasture; and 246 acres, 2 roods, of hill and moor ground; in all, 568 acres and a half, Scotch measure.

Finding the greater part of the moor of a dry gravelly

soil, I resolved to plant what was called the hill, with larch and Scotch firs; and, in the autumn of 1813, I agreed with Mr. Alexander Rennie, nurseryman at Aberdeen, for planting it accordingly, and contracted also for having it enclosed with a turf fence, which was executed in a substantial manner, and stands well.

The extent of the hill is 200 odd acres, 12 of which being peat moss, were unfit for planting; the remainder, 191 acres, 3 roods, 13 furlongs, were planted in spring, 1814, with two year old seedling larch and Scotch fir, in nearly equal quantities; and the inner side of the fence was filled up in the autumn of that year with larger larches.

The plantation has all been completely filled up, where deficient, during the year 1816, and the whole appears to be in a very thriving state, though in a cold, exposed situation.

I have also filled up a small plantation of twenty-one acres, which had been made some years before I purchased the estate, with transplanted larches, which are all doing well.

A considerable proportion of both the arable and pasture land being wet, and even marshy, I resolved to drain the whole as completely as possible, and accordingly, since 1813, I have laid out about £200 upon drains, which have proved of great advantage. For the drains made on the boundaries of the estate I have charged the tenants nothing, and only 5 per cent. per annum on the amount of the expence of the field drains; by which they are great gainers, the benefit they derive being fully equal to from 15 to 20 per cent. per annum, during their leases. I also am a gainer, as the tenants are now better able than formerly to pay their rents, and my property is considerably improved.

I have

I have expended upon this estate, since Whit Sunday 1813—

| | | | |
|---|---|---|---|
| For planting - - - | £ 235 | 2 | 10½ |
| — Fence to protect it - - | 77 | 16 | 8 |
| — Drains - - - - | 202 | 14 | 9½ |
| — Roads - - - - | 53 | 17 | 7 |
| | £ 569 | 11 | 11 |

being full 20*s.* per acre on the whole extent, arable, pasture, hill, and moor.

I request you will have the goodness to acknowledge the receipt of this communication; and I have the honour to be,

Sir,

Your most obedient humble Servant,

JOHN LAWSON,

*Old Mills, near Elgin, October 19th,* 1816.

To. C. Taylor, M. D. Sec.

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Certificates.

I do hereby certify, of my own knowledge, that what is within stated by John Lawson, Esq. relative to planting and draining the lands of Chappletown, in this parish, is strictly true; and that these improvements have added greatly to the beauty, as well as value of the estate.

Robert Gordon, Merchant.

*Drumblade, October 21st,* 1816.

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At Aberdeen, the twelfth day of November, eighteen hundred and sixteen years, in presence of Francis Gordon,

Esq. of Kincardine, one of his Majesty's Justices of the Peace for the county of Aberdeen, appeared ALEXANDER RENNIE, nursery and seedsman in Aberdeen, who being solemnly sworn, depones, that having been employed in the year 1813 by JOHN LAWSON, Esq. of *Chapletown*, in the parish of *Drumblade*, and county of *Aberdeen*, to plant for him a moor, or hill, which he accomplished within the period given, viz. first of December, 1813, to first of April, 1814, by planting thereon 380,000 larches, and 384,000 Scotch firs, all two years old seedlings; and 5,000 large larches on the inside of a dyke, inclosing the 191 acres above mentioned, all within the foresaid period: Further depones, that in October, 1815, he filled up the vacant spaces of the foresaid plantation with 120,000 Scotch firs, 57,000 larches, and, for the dyke sides, 300 large larches: that, in October, 1816, he filled an older plantation of twenty-one acres with 5,000 large larches, 15,000 transplanted Scotch firs, and 1000 large beeches: that the whole is now in a very thriving condition, and well fenced with a peat dyke and ditch, the surface water being properly carried off; all which is truth, as the deponent shall answer to God.

ALEXANDER RENNIE.

FRANCIS GORDON, Justice of Peace, Aberdeenshire.

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SIR,

I SEND you enclosed a statement made out by ALEXANDER RENNIE, of what trees he planted for me at Chapletown, by which you will see, that in October, 1816, he put into the plantation 18,000 Scotch firs, which had been omitted in his

his affidavit, to which I had annexed the pencil marks, showing the numbers planted in the whole, including 80,000, by Mr. MILNE, the former proprietor. Respecting the ground, it is a dry, gravelly soil, upon which there grew short heath, and on which small-sized sheep used to procure a scanty subsistence, but by no means of much value; so little so, that the tenant had given up keeping any of them on the moor, and did not object to its being planted. From the thinness of the soil, and the dryness of the ground, I considered it very fit for planting, as the moor was too gravelly and too much exposed for improving; besides, the distance both from the sea and lime would have made the expence of improving more than it could ever have re-paid. Upon the whole, I considered planting the only proper use to be made of it, and, from its present appearance, I have every expectation of being amply repaid in the end: should the wood thrive, it must prove valuable from there being few plantations of *Forest Trees* in that part of the country.

I am, respectfully,
Sir,
Your obedient Servant,
JOHN LAWSON.

*Old Mill, March 24th*, 1817.

To ARTHUR AIKIN, Esq. SEC.

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PLANTED for JOHN LAWSON, Esq. between the first of December, 1813, and the first of April, 1814, 191 acres, 13 furlongs, with 380,000 larch, and 384,000 Scotch firs, all two years old seedlings; also 5,000 large larch in the back of the dyke; also, in October, 1815, I filled up the said plantation with 120,000 Scotch firs, and 57,000 larch, and

300 large larch for the dyke sides; and, in October, 1816, 18,000 Scotch firs; also, for the other 21 acres, I have sent 5000 large larches, 1500 transplanted Scotch firs, 1000 large beeches.

(Signed)

ALEXANDER RENNIE.

*** The pencil marks, to which Mr. Lawson alludes in the foregoing letter, stand thus:

| Larch | Scotch Firs | Beech | | |
|---|---|---|---|---|
| 380,000 | 384,000 | 1,000 | Larch | 447,300 |
| 5,000 | 120,000 | | Scotch Firs | 537,000 |
| 57,000 | 18,000 | | Beech | 1,000 |
| 300 | 15,000 | Planted by J. Lawson | | 985,300 |
| 5,000 | | | | |
| 447,300 | 537,000 | Planted formerly by Mr. Milne | | *80,000 |
| | | Planted upon Chappletown | | 1,065,300 |

* Which appeared to have been half Larch and half Scotch Firs.

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SILVER ISIS MEDALS *were this Session presented to the* EARL OF JERSEY, *and to* HENRY GRANT, *Esq. for Embanking 300 Acres of Land on the Gnoll and Britton Ferry Marshes. The following Communications were received by the Society on the subject.*

SIR,

OBSERVING the encouragement held out by your valuable Society, for the *Recovery of Land from the Sea*, we have

have caused the inclosed statement to be laid before you, of the mode of embankment by which we have recovered about 300 acres of excellent marsh land. Before this undertaking, the whole of it was open to the influx of the sea, and covered with water several feet deep every spring tide, exclusively of being liable to inundation from land floods.

The deposits of sand and mud thus continually left on the land, and the numerous deep holes with which it abounded from the action of currents, rendered the herbage of little value; since this improvement, the whole of the land thus recovered is expected to produce, on an average, from 40s. to 50s. per acre, even under all the present pressure upon the agricultural interests.

The present low price of labour will, we presume, be fully adequate to meet any temporary depression in the value of land recoverable in similar cases, and we trust this statement, if it should be deemed deserving of a place in the volume of Transactions of your Society, may be the means of encouraging others to follow an example, combining public benefit with private interests. There seems good reason to believe, that this and other undertakings of the like nature might materially improve the port of Neath, now become a place of great traffic in coal and culm, by confining the river to its natural bed; and the employment, in works of this nature, of some of the surplus labour with which most parishes at present abound, would, at the present crisis, operate towards the relief of all classes.

We are, Sir,
Your most obedient Servants,

JERSEY.
H. GRANT.

*London, May 29th,* 1816.

To C. Taylor, M. D. Sec.

Copy of an estimate of an intended embankment of a salt marsh adjoining Neath river, in Glamorganshire, referred to in the accompanying statement submitted to the Society for the Encouragement of Arts, &c. which estimate was delivered to the Earl of Jersey, and Henry Grant, Esq. proprietors of the said marsh, 11th Aug. 1815, by

Evan Hopkin,
David Hopkin,
Roger Hopkin,
} Engineers.

| | | | |
|---|---|---|---|
| To 3288 yards of embankment - - - - | £1479 | 12 | 0 |
| To 4 culverts, with all necessary mason water-work, and inside gates to admit and confine the tide within the embankment if required. | 160 | 0 | 0 |
| | £1639 | 12 | 0 |

The following particulars respecting an embankment of about 300 acres, situate on the river Neath, in Glamorganshire, are submitted to the Society for the Encouragement of Arts, &c. by Mr. Lewis Thomas, jun. of Britton Ferry, Steward to the Earl of Jersey, at the instance of his Lordship, and of Henry Grant, Esq. of Gnoll Castle, in Glamorganshire.

The Earl of Jersey having recently become intitled to the Britton Ferry estate, arrangements were speedily made between his Lordship and Mr. Grant, the owner of an adjoining estate, for recovering a tract of about 300 acres of marsh lands, upwards of 100 of which belonged to his lordship, about 150 to Mr. Grant, and the remainder to Herbert Evans, Esq. of Eagles Bush. For time immemorial this tract had been covered during every spring tide with several feet of water, and was also partially covered

by

by low tides and land floods; it lies upon the banks of the river Neath, near its confluence with the sea, between Britton Ferry and Neath; is flanked by the Neath canal towards the south, and by the river towards the north, the frontage extending on the river side 3288 yards.

The undertaking was principally entrusted to Mr. Evan Hopkin, a farmer on the Earl of Jersey's estate, now upwards of seventy years of age: he has for many years acted as an engineer with great advantage to his employers; and various works of that nature will long remain to attest that natural talent may be very useful, though unaided by education; in the execution of this work he had the assistance of two sons, who are also very able men as engineers.

The estimate made on this occasion is subjoined, because, unlike most estimates in similar cases, it constitutes the whole charge of the undertaking, and a sketch of a plan is added, to convey a more correct idea of the embankment.

The sea bank was carried the whole length of the inclosure next the bed of the river, as near to it as the nature of the soil would admit; its length is 3288 yards; its breadth 29 feet at the base, from 4 to 6 feet at the top, which is flat, and its perpendicular height averaging 6 feet, except a part nearest the sea, where the swell is often very considerable, and which is 42 feet at the base, 6 feet at the top, and 9 feet high; the soil being at this part of a very sandy texture, and not so well adapted for an embankment. Advantage was taken of several pills formed by currents across the land for the purpose of draining off the rain and land-water, and any leakage from the canal into the river at low water, by means of culvert and tide-gates.

The land is uniformly to the depth already ascertained, being about three feet, a strong deep alluvial soil, capable of

of close consolidation; great attention was paid in the formation of this bank; its base was formed of sods neatly cut and exactly fitted, and let into the ground 6 or 8 inches below the surface, with the grassy side outwards, and particular care taken that no vacancies should be left between the sods to admit water, and the whole well beaten and rammed together: in this manner the bank was continued nearly its whole length, and to about half its height, and the spring tides were then suffered to flow over its top, strengthening and consolidating the work into so compact a mass, that there has been little or no settlement in the bank, which now presents a firm grassy surface; no vacancies being perceptible between the sods, though it has experienced all the vicissitudes of weather. A ditch was cut on the land side, which furnished part of the materials for the bank, and the rest were taken from the surface of the river side, at a proper distance.

The work was performed in the months of September, October, November and December, notwithstanding the frosts that then prevailed. The contractors were allowed 18 months to finish the undertaking, but by diligence, and by employing many hands, the whole was accomplished, and the tides effectually excluded, within sixteen weeks. They were so confident of success, that they agreed to insure against all accidents and repairs during three years, for the moderate premium of £100. Hitherto they are under no apprehension of the failure of the works. They have seen some unusually high and stormy tides beat against the bank to within a very few inches of its top, without doing the slightest damage, and it has now stood through one winter. Until this improvement the land would not have let for more than 5s. per acre, the herbage being of no value for a great part of the year: it was much

intersected

intersected by ravines and holes formed by, and generally full of water; but in consequence of this embankment, I consider the land thus recovered (even in the present depressed state of agriculture) well worth from 40s. to 50s. per acre, without any further expense being incurred by the landlord.

Much land in this neighbourhood may be recovered or greatly improved by similar means; and if these facts should be thought to bring the case within the class 42 in your list of Premiums, and thereby promote the circulation of information through your valuable Transactions, it may be hoped that others will be encouraged by the manifest advantage of this undertaking.

It is not to be expected that public spirit, unassisted by private gain, can effectually employ the great mass of surplus labourers with which this country now abounds—in such works as these they are both signally united.

The facts here detailed falling within my own personal knowledge, in my native place, and where I have been some time professionally employed, I can speak to the correctness of this representation.

LEWIS THOMAS, Jun.

*Britton Ferry, June* 14, 1816.

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We the undersigned having made enquiry into the general state of facts, above set forth, do certify the same to be true. Dated this 19th of June, 1816.

Dynevr.

Thomas Frankleen, *a Magistrate for the County of Glamorgan.*

Edmund Thomas, *Curate of Britton Ferry.*

The

The facts above stated are within my personal knowledge, and I beg leave to bear testimony to the correctness of the statement.

GEORGE TENNANT.

*Gray's-Inn.*

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*The* SILVER MEDAL *of the Society was this Session presented to Mrs.* HANNAH D'OYLY, *of Red Car, near Gisborough, for the culture of Bull-Rushes, (Scirpus lacustris) for the use of Chair-makers. The following Communications were received from her on the subject, and a Sample of the Bull-Rushes is preserved in the Society's Repository.*

SIR,

THE liberality I formerly experienced from the Society for the Encouragement of Arts, &c. for my method of *rearing Poultry*, and the assurance I have that any exertion for improvement, however simple in its nature, will meet with their encouragement, induce me to take the liberty of communicating a method of converting ponds, which are occasionally overflowed, into use and profit. A part of the low lands about this place are subject to be flooded from the Swale, to confine which, Mr. D'OYLY has embanked them. With his permission, I have planted those banks with willow, and the ponds out of which the earth was thrown I have planted with the bull-rush, provincially called the

polesieve.

polesieve. The parcel sent is a specimen of the kind, and I believe I am the only grower of them in this country.

The seed apparently vegetates in the tender soil on the banks of rivers, from whence the rapid floods in winter wash the roots to the sharp angles of some of our rivers, where they grow in patches. They are rarely to be met with in this part, and the upholsterers, coopers, &c. chiefly depend on Holland and other countries for what they want, and in time of war they fetch an exorbitant price.

I am, Dear Sir,
Your most obedient Servant,

HANNAH D'OYLY.

*Sion Hill, near Thirsk, March 14th*, 1816.

To C. Taylor, M. D. Sec.

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SIR,

According to your request, I have ordered a sample of the bull-rushes to be sent, although I much fear it will consist merely of the refuse, the crop having been disposed of at the latter end of the year. These iron times will not permit a prudent person to speculate, otherwise I should like to pay a small remuneration for the useless pieces of water there are in this country, and plant them with bull-rushes. I believe, near almost every town, ponds have been made, where clay has been thrown out for bricks, and in such situations they would surely pay for the expence of planting them with young plants raised from seed, if they only sold for fuel to kindle fires. They are a deciduous plant, and you will know from the sample the height they run up to in a season, and growing almost as thick as a brush, a small

piece

piece of water will produce a great burden. In time of war there is a scarcity, and they fetch a high price, and you know, Sir, peace, like every thing else in this world, is very uncertain; at any rate the Committee will judge most proper.

I have the honour to be, Sir,
Your humble Servant,
H. D'OYLY.

*Red Car, near Gisborough, March 12th*, 1817.

To A. Aikin, Esq. Sec.

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SIR,

My method of cultivating the bull-rushes was merely to divide and plant the roots, which the farmers were obliged to throw out from the bed of the river Triske, on account of their obstructing the current; but, had I an opportunity of planting on a larger scale, I should certainly raise them from seed; it might be easily procured the latter end of the year, when it is fully ripe. It should be sown in the spring, in a low situation, after the floods had subsided, on a tender light soil, where it should remain a year or two; but I do not recollect having seen any above a foot and a half high that were not growing at least that depth in water. When mine were planted, the workmen threw a line across the ponds, and forced the roots into the mud with a three-pronged fork, in rows ten inches apart; but, where the water is not too deep, it is a more ready and safe way for the man to press them down with his foot.

Just before the commencement of Peace, an upholsterer at Wakefield offered me for them five shillings per bundle, measuring 3 feet 9 inches in circumference, 9 inches from the

the bottom. When properly cultivated, they grow as rank as corn, and most likely average the same quantity per acre, shooting three or four times as high.

I have the honour to be, Sir,
Your obedient Servant,

HANNAH D'OYLY.

*Red Car, May 4th*, 1817.

To. A. Aikin, Esq. Sec.

# PAPERS

IN

# CHEMISTRY.

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TWENTY GUINEAS *were this Session voted to Mr.* R. WYNN, *of Wellington Place, Vauxhall, for Receipts for Enamel Colours, and for Staining and Gilding Glass. The following Communications were received from him on the subject, and Specimens of the Colours are preserved in the Society's Repository.*

SIR,

THE liberality of the Society in encouraging and rewarding communications in every useful art, induces me to offer to their notice a concise and compleat method of composing enamel colours. Painting in enamel colours has always been considered very interesting, and one of the most costly productions of art in every country where practiced; but the real preparation of the colours has always been confined to the knowledge of a few persons who have made a mystery of it, and whatever has been yet published on the subject,

appears to be chiefly the compilation of writers unskilled in the profession. Many artists of superior talents, in different parts of this country, could practise the art but for the difficulty of procuring a compleat set of good colours: indeed it is extraordinary with what suspicious secrecy the art of making the proper enamel colours has hitherto been conducted. I have been acquainted with several of the best manufacturers, whose colours were used by the most eminent painters on the finest and most elaborate works of the time, who have died without ever benefitting their country by publishing their acquirements, or leaving any documents behind them. By a continued perseverance in such secrecy, it is not impossible that the present improved state of knowledge in the art might, under unfavourable circumstances, be entirely lost, if some experienced professional person did not seek for an opportunity of making it public, and more generally useful. With these motives I take the liberty to offer the accompanying treatise, which consists of the most valuable selections from the experience and labours of above twenty years.

I am, Sir,
Your most obedient Servant,
ROBERT WYNN.

*Wellington Place, Vauxhall,*
*March* 11, 1817,
To A. AIKIN, Esq. Sec.

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*Introductory Remarks.*

The different qualities or degree of purity in the ingredients as usually met with, will with the same prescriptions, produce some slight variations in effect, but the best enamel colours

colours may always be obtained with certainty by careful attention to the following receipts.

When metals are dissolved, the solutions should always be perfectly saturated. In making the fluxes, they should be sufficiently melted in the crucibles, so as to flow liquid and pour out easily.

The various qualities of the material, or surface, on which painting in enamel is performed, require the colours to be adapted to the degree of heat it will bear or require when burnt; and it is generally the practice of the best painters in enamel, to use for the first painting and burning, colours considerably harder than those used in the second painting and burning, the latter being fine soft enamels, in order to finish the work, and give a beautiful smoothness. It cannot but be obvious to every person who uses enamel colours, that the hardening them if necessary, will be effected by adding more of the colouring matter; or lessening the quantity of flux, and, if required to be more soft, or to shine more when burnt, to add a little more flux, and this is best done by a very soft flux generally used for this purpose, such as No. 8; but when particular directions are necessary, they will be found mentioned in the receipt for making the colour. It will be better to make a few ounces at least of each colour at a time, and they are all to be ground as soon as made in water, with a glass muller, or a piece of plate glass, and dried before the fire, then scraped off in powder, and kept in bottles for use.

When used in painting, they are ground in spirits of turpentine, and thickened with thick oil of turpentine, which quality the fluid oil of turpentine acquires in three or four years.

## Preparation of Ingredients

### *Flint Powder.*

Take pieces of flint, which have been burnt white at the chalk lime burners (they may be had at the lime burners at Vauxhall,) make them clean with hot water and a brush; then throw them red hot into cold water; after having thus treated them two or three times, pulverize them in a biscuit-ware mortar with a pestle of the same, (which will be easily effected), and then grind them in water on plate glass.

Where no opportunity occurs of procuring burnt flints from the lime burners, the common black flints broken into pieces, made hot in boiling water (to prevent their flying in the crucible,) and treated in the same way, will produce a fine white powder.

### *Red Sulphate of Iron.*

Sulphate of Iron, otherwise called Green Vitriol, is to be pounded and placed in an earthen ware muffle, (which may be had at the ironmongers, in Foster Lane; or at Mr. Accum's, in Compton Street) till the moisture is evaporated and a grey powder left: which place in a crucible in a charcoal fire, and stir it with a piece of steel bar, till it is of a fine red colour; then let it fall out of the crucible into a pan of cold water, under a chimney, to avoid the disagreeable fumes that arise; when settled at the bottom wash it in several hot waters, and then dry it for use. The more it is burnt, the darker the red.

### *Brown Sulphate of Iron.*

Take sulphate of iron in lumps, and calcine it in a red charcoal heat; till it becomes of a dark brown, and let it cool in the crucible, afterwards wash it repeatedly in hot water.

*Black*

*Black Oxide of Copper.*

Take copper and dissolve it in aquafortis, till the acid refuses to take up any more metal; then dilute the solution with water, and add to it some sub-carbonate of potash, dissolved in water; a green precipitate will fall to the bottom, which must be washed in several hot waters; when settled, pour off the superfluous water, and place the green matter at the bottom on a piece of coarse open canvas, tied over a large earthen pan, on which a piece of blotting paper is laid; after the precipitate has been thus drained, it should be taken off and made perfectly dry, by placing the paper on a drawer of powdered chalk to absorb more of the moisture, and then placed before the fire. When dry, calcine it in a crucible in a charcoal fire, and throw it red hot into cold water; then rince it in boiling water, and dry at the bottom of the bason before a fire; what remains is a beautiful black oxide of copper.

*Green Oxide of Copper.*

Take a saturated solution of copper in aquafortis, and precipitate it with sub-carbonate of potash; then wash it several times in boiling water, filter and dry it.

*White Oxide of Tin.*

Into a small wooden box with a sliding cover, chalked over on the inside, pour melted tin from a ladle, and shake the box till the tin becomes finely granulated; then wash it and dry it, and put it into a Florence oil flask, and pour over it strong nitrous acid, which rapidly converts it to a white powder. When a sufficient quantity of this is obtained, it should be well washed in several boiling waters, poured out into a bason, and dried before the fire;—it then produces a very white oxide of tin.

### *Black Oxide of Cobalt.*

Take good metallic cobalt *, and dissolve it to saturation in nitric acid diluted with a little water, in a flask placed in sand over the fire; then pour it in a large bason, and having added a quantity of water, pour in a solution of sub-carbonate of soda, as long as any precipitate falls down: when settled pour off the water, and wash the powder in several hot waters, filter it and dry it: When dry, mix it in a biscuit ware mortar with a pestle of the same, with three times its weight of dry nitre; place it in a warm crucible, and drop in an ignited piece of charcoal: some slight explosions will then take place, and when these have ceased, make the calx red hot; this after being washed and dried, produces the best oxide of cobalt for enamel; and capable of making and compounding various colours.

### *Fluxes.*

Take great care to mix all the ingredients accurately together, in a biscuit-ware mortar, with a pestle of the same, and to have them all pounded as fine as possible. Let the crucibles be made warm before the fluxes are put into them, (by placing them on the fire with the open end downwards,) which will prevent most of the accidents which happen by their breaking in the fire.

The best furnace for making fluxes, or for any other process that requires great or continual heat, is a common german stove about 18 or 20 inches inside, lined all round from the grating to the top, (except the aperture at the door in the front for the occasional introduction of a muffle,) with

* In the choice of cobalt, that which when dissolved in nitric acid, gives the purest and deepest red solution generally makes the finest colours.

one row of fire-bricks set with loam ; the iron-pipe chimney projects from the back part near the top. The top or cover of the furnace, to be loose like a lid, and removable by handles ; in the center of it a circular hole is cut out, which is also fitted with a cover through which the top of the crucible may be lifted off, and its contents be stirred up with a bar of steel. A small piece of fire-brick is placed on the grate, for the crucibles to stand on, and the fuel should be charcoal and coke mixed, or charcoal alone.

Flux, No. 1. red lead 8 parts by weight,

| | | |
|---|---|---|
| | *Calcined borax | 1½ |
| | Flint powder | 2 |
| | Flint glass | 6 |
| No. 2, | Flint glass | 10 |
| | White arsenic | 1 |
| | Nitre | 1 |
| No. 3, | Red lead | 1 |
| | Flint glass | 3 |
| No. 4, | Red lead | 9½ |
| | Borax not calcined | 5½ |
| | Flint glass | 8 |
| No. 5, | Flint glass | 6 |
| | Flux, No. 2, | 4 |
| | Red lead | 8 |
| No. 6, | Flux, No. 2, | 10 |
| | Red lead | 4 |
| | Flint powder | 1¼ |
| No. 7, | Flux, No. 4 | 6 |
| | Colcothar | 1 |

* Borax calcined to a dry white calx in a crucible, only a third part of which should be filled at once, on account of the borax swelling so much as it gets hot.

| | | |
|---|---|---|
| No 8, | Red lead | 6 |
| | Borax not calcined | 4 |
| | Flint powder | 2 |

After the fluxes have been melted, they should be poured on a flag-stone wet with a sponge; or into a large pan of clean water, then dried, and finely pounded in a biscuit-ware mortar for use.

*Yellow Enamels.*

| | |
|---|---|
| Red lead | 8 |
| Oxide of antimony | 1 |
| White oxide of tin | 1 |

Mix the ingredients well in a biscuit-ware mortar, and having put them on a piece of Dutch tile in the muffle, make it gradually red hot, and suffer it to cool.

| | |
|---|---|
| Take of this mixture | 1 |
| Of Flux, No. 4 | $1\frac{1}{2}$ |

Grind them in water for use.

By varying the proportions of red lead and of antimony, different shades of colour may be obtained.

*Another Yellow.*

Take three parts by weight of sheet lead and one part of block tin, melt them together in a ladle or a flat shovel, and skim off the top in proportion as it oxidates; when a sufficient quantity is obtained, place it in the muffle in a gentle heat, to reverberate and entirely calcine any remaining particles:

| | |
|---|---|
| Of which take | $7\frac{1}{2}$ |
| Oxide of antimony | 1 |
| Litharge | 1 |

Mix

Mix these well together, and give them a red heat in a muffle to bind them together, but not to melt. Use the same flux as for the other yellow.

*Orange.*

| | |
|---|---|
| Take red lead | 12 |
| Red sulphate of iron | 1 |
| Oxide of antimony | 4 |
| Flint powder | 3 |

Well mixed in the mortar, and calcined so as to stick together, but avoid melting.

| | |
|---|---|
| Take of the above | 1 |
| Flux, No. 7, | 2½ |

Grind for use.

*Dark Red.*

| | |
|---|---|
| Take sulphate of iron calcined dark | 1 |
| Flux, No. 7, | 3 |

Grind for use.

*Light Red.*

| | |
|---|---|
| Take red sulphate of iron | 1 |
| Flux, No. 1. | 3 |
| White lead | 1½ |

Grind for use.

*Red Brown.*

| | |
|---|---|
| Take brown sulphate of iron calcined dark | 1 |
| Flux, No. 1. | 3 |

Grind for use.

*Vandyke*

*Vandyke Brown.*

Take Flux, No. 4 3
Iron filings 1

Melted together in a crucible, and drawn out with curling tongs; * with so much metal it will not pour out freely.

Take of the above 5
Black oxide of cobalt 1

Grind for use.

*Another Brown.*

Take manganese $2\frac{1}{4}$
Red lead $8\frac{1}{2}$
Flint powder 4
calcined to stick together.
Of this mixture take $1\frac{1}{2}$
Of flux, No. 4, and iron filings melted as above $1\frac{1}{2}$
Flux, No. 4, 1

Grind for use.

*Black for painting and mixing with other colours.*

Take of umber, broken into small bits and calcined to a yellow heat in a crucible, till quite black, then washed in boiling water and dried, 10

Black oxide of cobalt 10
Blue flint glass $10\frac{1}{2}$
Raw borax $7\frac{1}{2}$
Red lead 12

* In this and in other cases where a muffle is not in readiness, an earthen crucible washed with flint powder inside, or with dry flint powder rubbed inside $\frac{1}{8}$ of an inch thick, may be used, and the materials when partially melted, so as to stick together, are completely taken out without loss.

Calcine

| | |
|---|---|
| Calcine these well together and take of it | 2 |
| Flux, No. 4, | 1 |

Grind in water for use.

Blacks are compounded in other proportions of these ingredients, and manganese is sometimes substituted in the place of umber.

*Another Black.*

| | |
|---|---|
| Take umber calcined black | 1 |
| Black oxide of cobalt | 1½ |
| Black oxide of copper | ½ |
| Flux, No. 4, | 3 |

Grind these in water, and when dried place them on a piece of dutch tile; (washed over with flint-powder ground in water,) in a muffle in a charcoal fire, and calcine them so as to stick together, then add to it one half of Flux, No. 4. Both these blacks if too soft, are hardened by adding a little black oxide of cobalt.

*Black for shading and drawing under the Greens.*

| | |
|---|---|
| Take manganese | 5 |
| Royal smalt | 1 |

Ground fine in water, and calcined to a high degree of heat in a muffle.

*A beautiful Black, for solid grounds or inlaying, but does not mix generally.*

| | |
|---|---|
| Take black oxide of copper | 1 |
| Flux, No. 4, | 2 |

Grind in water for use.

*A Frit*

*A Frit for transparent Greens.*

| | |
|---|---|
| Take flint powder | 3 |
| Flux, No. 2, | 3 |
| Green pot-metal glass | $1\frac{1}{2}$ |
| Red lead | $7\frac{1}{2}$ |
| Raw borax | $2\frac{1}{2}$ |
| Green oxide of copper | $1\frac{1}{4}$ |

Melt them in a crucible, pour out the mass, and pound it in an earthenware mortar.

*Green.*

| | |
|---|---|
| Take of the green frit | 3 |
| Of yellow enamel colour made up as before directed | $1\frac{1}{2}$ |

If too soft add Naples yellow.

Grind in water for use.

*Another Green.*

| | |
|---|---|
| Take of green frit | 5 |
| Flux, No. 2, | 1 |
| Flux, No. 6, | $2\frac{1}{2}$ |

Grind in water for use.

Greens in painting on enamel, are formed of various shades by mixing blue and yellow, or blue and orange, &c. in different proportions.

*Blue.*

| | |
|---|---|
| Take of black oxide of cobalt | 4 |
| Flint powder | 9 |
| Nitre | 13 |

Mix them well in an earthenware mortar, and heat them in the crucible, in a strong fire of coke and charcoal, till perfectly

perfectly melted*; then pound the mass, wash it in cold water, and dry it.

Of this take - - 1
Flux, No. 5, - - - 1

Grind in water for use.

*Another Blue.*

Take black oxide of cobalt 1
Raw borax - - - 1

Melt them together.

Of this mixture take - 2
Blue pot-metal glass - 10
Red lead - - - ½

Melt them in a very strong fire. If either blue is too soft, add a little royal smalt; if too hard, a little flux made of blue glass 2, borax 1.

*Purple.*

Take fine grain gold from the refiners, and dissolve it to saturation in an aqua regia made of strongest

Nitric acid - - 1
Muriatic acid - - 3 } by measure.
Distilled water - - 3

Make the solution in a clean Florence oil flask, placed on sand near the fire. Pour melted tin into cold water, and take of the clean parts of this tin 1

Aqua regia, diluted with water in the same proportion as above - - 4

* If these preparations are not sufficiently fluid in the melted state to pour out of the crucible, the colour will stick to a piece of steel bar when it is warm, and may be drawn out; and sometimes the blues are made in crucibles lined with flint powder as before mentioned.

Place

Place the acid and the tin in a large bason covered with a plate, in a temperate heat; when the tin is all dissolved, add,

Tin - - - - 1
Strong red fuming nitrous acid 1½

and instantly cover the bason with the plate, to prevent the fumes from escaping. After standing 24 hours, a little distilled water should be poured into the bason. The solution of tin may then be put into a clean phial for use, adding to it a few grains of tin; examine it after four or five days, when the solution, if carefully made, will be of a fine and clear dark colour, and fit to make the purple with. Then of the solution of gold take sufficient to colour distilled water of a faint straw yellow, and drop gradually into it the solution of tin, and a most beautiful purple precipitate will immediately be formed, which must be thrown as it is made into a large vessel, and two or three pieces of the melted tin should be put at the bottom.

Mix the solution of tin with that of the gold in this manner till the last added drops occasion no turbidness in the liquor; the precipitate is then to be washed in several hot waters, filtered on the blotting paper and canvas, and while in a moist and soft state, mixed with flux, No. 4, finely powdered.

The proportion of flux to the purple precipitate is always various, and is judged of by the mass being of a good rich and dark colour, as the ingredients are ground together on the plate glass. Care must be taken to grind this colour before it gets dry.

Twenty-four grains of gold made into a precipitate in this manner will take two ounces of flux, and this may be a rule to the inexperienced practitioner.

To

*Rose Colour.*

To a saturated solution of gold in aqua regia (containing twenty-four grains of gold), diluted with 100 times its bulk of warm distilled water, having 20 grains of alum* dissolved in it, add caustic ammonia drop by drop as long as any precipitate is thrown down, which wash in several hot waters.

To 24 grains of gold, precipitated in this manner, put

| | |
|---|---|
| Flux, No. 4 - - | 2 oz. |
| Flux, No. 3 - - | 2 oz. |

Mix them together wet, and grind them on a plate glass, adding, by a leaf at a time, 16 leaves of leaf silver; when the whole is ground fine, let it be dried on the glass, scraped off, and put in a bottle for use.

This rose colour grinds of a grey or slate colour, but after being ground, if placed in a muffle and exposed to a gentle heat, it will turn to a red; but it is fit for use in either state.

If too yellow, add a little purple; and if too purple, add more leaf silver.

*Another Rose Colour.*

| | |
|---|---|
| Take purple made as before directed | 1 oz. |
| Flux, No. 3 - - - | 4 |
| Muriate of silver - - | 10 gr. |

The latter ingredient is prepared by dissolving silver in aqua fortis, and precipitating it with common salt.

Grind in water for use; if too purple, add more muriate of silver.

* The rose colour is sometimes made without any alum.

*Opake*

*Opake White.*

Hartshorn shavings burnt in a crucible, in a charcoal fire, till perfectly white - . - 1
Flux, No. 1 - - 1

Grind in water for use.

Venetian white cake enamel 1
Flux, No. 8 - - ¼

Grind in water, then calcine them together in a muffle.

Flux, No. 2, pounded and washed, then dried and calcined in a muffle.

It would not be difficult to exhibit a multitude of specimens of different tints, and fill a volume with descriptions of them, by combining these original enamel colours in various proportions: this, however, may safely be left to the taste and experience of the artist. My object has been to avoid every thing superfluous, and at the same time to explain the processes adapted to immediate practice in terms not liable to be mistaken.

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SIR,

WHEN I had the honour of explaining my Treatise on Enamel Colours to the gentlemen forming the Committee of Chemistry, I was requested by them to produce the method of *staining glass*, with a view of adding it as a second part to the Treatise on Enamel Colours.

I have inserted the most valuable information which I possess on this subject in the paper that accompanies this letter, and

and request that you will present it in my name to the Society of Arts.

I am, Sir,
Your most obedient humble Servant,
ROBERT WYNN.

*No. 3, Taylor's-Buildings, May 6th*, 1817.

To A. Aikin, Esq. Sec.

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## *The Art of staining Glass.*

In *coloured glass*, the whole body of the material is tinged throughout by means of some colouring ingredient uniformly diffused through, or dissolved in, the substance of the glass.

In *enamelling*, the colours, being ground up with an easily vitrifiable flux, are laid on the surface of metal, or porcelain, or glass, and are then exposed to such a degree of heat as shall just melt the enamel, and then fix it on the surface of the substance on which it has been applied.

In *staining glass*, the colouring ingredients are mixed with water, or some other fluid vehicle, by means of which they are spread over the surface of a plate of glass, and when dry, are exposed to such a degree of heat as by experience has been found to be sufficient. The colour is then rubbed off from the surface of the glass, to which it does not adhere, and those parts of the plate which have been thus covered are found to have acquired a permanent and transparent tinge or stain, doubtless from some particles of the colour having been absorbed, and fixed in the pores of the glass.

In all the compositions for staining glass, silver, in some form or other, enters as an essential ingredient; I shall there-

fore begin by describing the different preparations of silver that I make use of.

Take two or three ounces of pure nitric acid, dilute it with three times its bulk of distilled water, put it into a Florence flask, or any other convenient glass vessel, and add to it refined silver, by small pieces at a time, till the acid, though kept at a warm temperature, refuses to dissolve any more. After standing quiet for some hours, pour off the clear liquor into a clean ground stoppered phial, and label it nitrate of silver.

---

*Preparations of Silver.*

No. 1. Dissolve common salt in water, and add nitrate of silver, drop by drop, till it ceases to occasion any precipitate; there will thus be obtained a heavy white curd-like substance, which must be well washed in hot water, and dried; by exposure to light, it becomes of a dull purple colour. It is known by the name of muriate of silver, or *luna cornea.*

No. 2. Dissolve subcarbonate of soda in water, and add nitrate of silver, as above described. The white precipitate thus obtained, when washed and dried, is ready for use. It is called carbonate of silver.

No. 3. Dissolve subcarbonate of potash in water, and proceed precisely as directed for No. 2. The white powder thus obtained is also carbonate of silver.

No. 4. Dissolve phosphate of soda in water, and proceed as already mentioned. The precipitate thus obtained is of a yellow colour, and is called phosphate of silver.

No. 5. Take any quantity of pure silver rolled out into thin plates, and put it into a crucible, together with some sulphur.

phur. When the crucible has been a short time on the fire, the sulphur will first melt, and then will gradually burn away with a blue flame. When the flame has ceased, add some more sulphur, and proceed as before; then take the silver out, and heat it red in a muffle; it will now be white, and very brittle, and, after having been reduced to powder in a mortar, is fit for use.

No. 6. Take any quantity of a dilute solution of nitrate of silver, and put into it a stick of metallic tin, warm it a little, and the silver will be precipitated in the form of metallic leaves on the surface of the tin. Scrape it off, wash it in warm water, dry it, and grind it in a mortar.

No. 7. Take any quantity of nitrate of silver, and put into it a piece of copper-plate; then proceed precisely as in No. 6.

The foregoing preparations of silver mixed with other ingredients, in the proportions about to be described, compose all the varieties of pigment which are requisite for staining glass.

*Yellow.*

| | | |
|---|---|---|
| Take silver, No. 2, | 1 | part. |
| Yellow lake - | 1 | |

Mix the ingredients, and grind them well with oil of turpentine mixed with the thick oil of turpentine; lay it on thin.

| | | |
|---|---|---|
| Take silver, No. 1, - - - | 1 | Parts. |
| White clay, precipitated from a solution of alum by subcarbonate of soda - - - - | 3 | |
| Oxalate of iron, prepared by precipitating a clear solution of sulphate of iron by oxalate of potash | 3 | |
| Oxide of zinc - | 2 | |

Let the silver be ground first in water with the oxide of zinc, and then with the other ingredients. This is intended for floating on thick.

Take silver, No. 3, 1
Yellow lake 1 } Parts.

Grind them in spirit of turpentine and oil, and lay the mixture on very thin.

Take silver, No. 4, - - 1
Yellow lake, - - 1 } Parts.
White clay, - - ½

Grind them in spirit of turpentine and oil, and lay the mixture on thin.

*Orange.*

Take silver, No. 6, - - 1
Venetian red and yellow ochre, equal parts, washed in water, and calcined red - 2 } Parts.

Grind the ingredients in spirit of turpentine, with thick oil of ditto, and lay the mixture on thin.

Take silver, No. 7, - - 1
Venetian red and yellow ochre 1 } Parts.

Grind in turpentine and oil, &c. as the foregoing. If entire panes of glass are to be tinged orange, the proportion of ochre may be greatly increased. The depth of the tinge depends in some measure on the heat of the furnace, and on the time that the glass is exposed to it, which, though easily learned by experience, cannot be made the object of precise rules.

*Red.*

*Red.*

| | | |
|---|---|---|
| Take silver, No. 5, - - - | 1 | Parts. |
| Brown oxide of iron prepared by heating scales of iron, then quenching them in water, reducing them to a fine powder, and lastly calcining it in a muffle - - - | 1 | |

Grind the ingredients with turpentine and oil, and lay the mixture on thick.

| | | |
|---|---|---|
| Take of antimonial silver, prepared by melting together one part of silver, and two ditto of crude antimony, and pulverizing the mass - - | 1 | Parts. |
| Colcothar - - - | 1 | |

Grind the ingredients in turpentine and oil, and lay the mixture on thick.

| | | |
|---|---|---|
| Take antimonial silver, prepared as above, | 1 | Parts. |
| Venetian red, and yellow ochre, of each, - - - - - | 1 | |

Grind, &c. as before mentioned.

When whole panes of glass are to be tinged, the proportions of ochre or of colcothar may be much increased, and the ingredients should be ground in water.

---

*Of laying on the Colour*

The method practised by most stainers of glass is to draw the outline in Indian ink, or in a brown colour, ground with turpentine and oil, and then to float on the colour thick, having previously ground it with water. But

in this way of proceeding it is very subject either to flow over or to come short of the outline, and thus render the skill of the draftsman of little effect.

My method is to draw the pattern in Indian ink, and having ground the colour as fine as possible in spirits of turpentine, brought to a proper consistence with thick oil of turpentine, to add a little oil of spike lavender, and to cover the outline entirely with this composition.

When it has become dry, I work out the colour with the point of a stick and a knife from those parts that are not intended to be stained, and am thus enabled to execute the most delicate ornaments, and most intricate designs, with exactness and precision.

If the colour is required to be laid on so thick that the outline would not be visible through it, let the colour be first laid on as smoothly as possible, and when it has become dry draw the outline upon it with vermillion water-colour, and work out the design as before.

Besides the precision acquired by the above method, it enables the artist to apply different shades in the same design; whereas the old method of floating only communicates an uniform tint to the whole pattern.

The artist should contrive to charge his furnace with pieces the colour of which is ground in the same vehicle, and not to mix in the same burning some colours ground in turpentine and others ground in water. The pieces must also be very carefully dried, and must be placed in the furnace when this latter is moderately warm.

*To gild Glass.*

Take of fine gold in grains 1
of pure mercury - 8 } parts.

Warm

Warm the mercury and then add the gold, previously making it red hot. When the gold is perfectly dissolved pour the mixture into cold water and wash it well. Then press out the superfluous mercury through linen or soft leather, and the mercury which runs through (as it retains some gold) should be reserved for the next opportunity.

The amalgam which remains in the leather is to be digested in warm aqua fortis, which will take up the mercury, but will leave the gold in the form of an extremely fine powder. This powder, when washed and dried, must be rubbed up with one-third of its weight of mercury; then mix 1 grain of this amalgam with three grains of gold flux (see the former part of this paper, p. 63), which is to be applied in the usual manner.

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FIFTEEN GUINEAS *were this Session voted to Mr.* JAMES CALLENDER, *of King's Head Court, Holborn, for a Method of seasoning Mahogany. The following Communications were received from him on the subject, and Specimens of the Mahogany seasoned after his Plan are preserved in the Society's Repository.*

SIR,

I TAKE the liberty of submitting to the consideration of the Society of Arts a method of seasoning mahogany plank in a few hours, which hitherto has not been done in less than a year.

The importance of this method is considerable: in the first place a considerable part of the capital which is invested in wood lying to season, during many months, may be saved.

In the second place, as none of the small stuff, from two to six inches thick, is ever seasoned, according to the usual course of trade, all articles made of such wood, such as chairs, ballustrades, &c. must necessarily be excessively subject to warp, which is prevented by adopting my expeditious mode of seasoning. The following is the method I make use of. Having provided a steam-tight wooden box capable of holding conveniently such pieces of mahogany as are fit for chairs, &c. I adapt to it a pipe from a boiler, by means of which I fill the box (after the mahogany has been put into it) with steam, the temperature of which is about equal to that of boiling water.

The time required for inch and a-half wood is about two hours, and pieces of this thickness will become sufficiently dry to work after being placed in a warm room or workshop for 24 hours.

The wood by this treatment is somewhat improved in its general colour, and those blemishes which are technically called *green veins* are entirely removed.

It is also obvious, that the eggs or larvæ of any insects which may be contained in the wood, will be destroyed by the heat.

I have myself made use of the method described for a year and a-half, and Mr. Dalziel, 26, Great James-street, Bedford-row, and Messrs. Gee and Hole, King-street, Holborn, have, by my advice, used the same practice with good success.

I am, Sir,
Your very humble Servant,

JAMES CALLENDER.

16, *King's-head-court, Holborn-hill.*

To A. AIKIN, Esq. Sec.

Mr.

Mr. Dalziel and Mr. Gee attended the Committee according to summons, and stated that they had adopted the practice of steaming mahogany as communicated to them by Mr. Callender, and which was in their opinion an original invention of the candidate. They farther said, that they had found by experience, that the method of steaming was an effectual way of seasoning small sized mahogany for chairs and other similar articles, and that mahogany so seasoned did not crack or warp by exposure to heat, a defect that wood, even after being seasoned in the ordinary way, is very liable to.

A piece of mahogany abounding in green veins had been sawn in two, one half had been exposed to steam, the other remained in its original state; the latter of these was declared by the above-mentioned cabinet-makers to be fit only for frame-work, while the former was in their opinion applicable to outside work. The following certificates also were delivered in to the Committee.

---

Certificates.

Sir,

You have known me in the wood trade sixteen years. I was twelve years prior to that time in the same trade; but I never heard (either among cabinet-makers, chair-makers, or any other branch in the wood line) of steam being applied either to hard or soft wood, to take out the sap or to season them.

I am, Sir,

Your humble Servant,

Thomas Sadgrove.

*Mulberry-court, Wilson-street, Moorfields,*
*May* 1, 1817.

N. B.

N. B. I think if any thing of the kind had been practised I must have heard of it.

To Mr. C. CALLENDER, &c.

SIR,

I HAVE been upwards of twenty years in the mahogany trade, but never heard of steam being applied for the purpose of drying mahogany.

I am, Sir,
Your most obedient Servant,
M. GILLCOCK.

*No. 85, Maid-lane, Bankside, Southwark.*

To Mr. CALLENDER, &c.

SIR,

I HAVE been above fifty-five years in the cabinet-making business, having served my apprenticeship to Mr. Seddon, of Aldersgate-street, where there were above 200 men employed in his manufactory; but I never heard of steam being applied for the purpose of drying wood, and should your method answer the purpose, it will be a most valuable acquisition to the trade.

I am, Sir,
Wishing you success,
Your obedient Servant,
GEORGE BIGGS.

*No. 9, Clerkenwell Green.*

To Mr. CALLENDER, &c.

SIR,

Having seen mahogany dried by steam in your shop, I must

# Dr Clanny's Steam safety Lamp. Pl. 1.

Fig. 2.

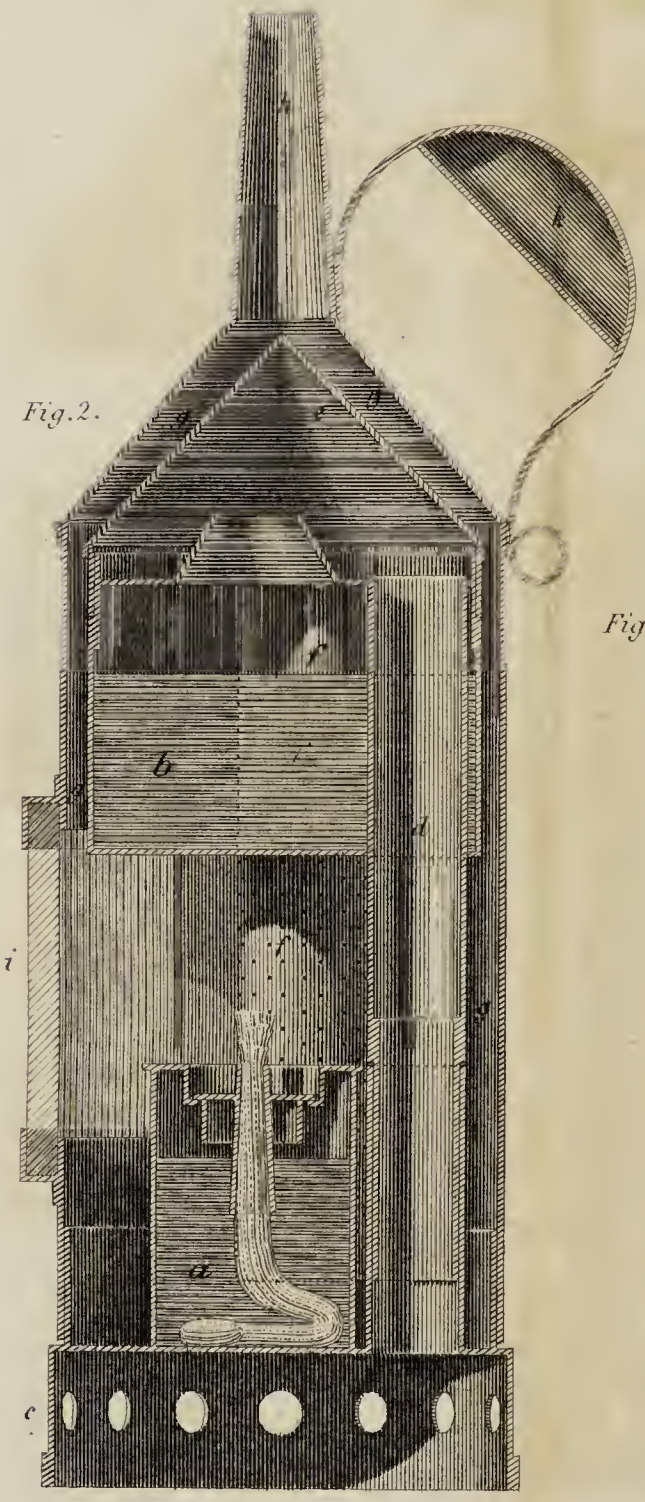



Fig. 3.

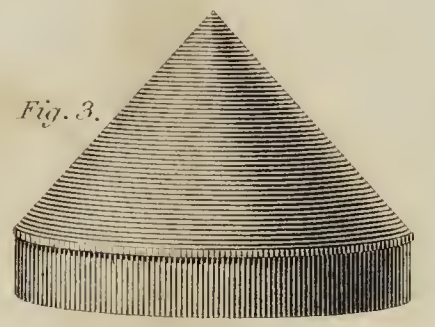


Fig. 5.

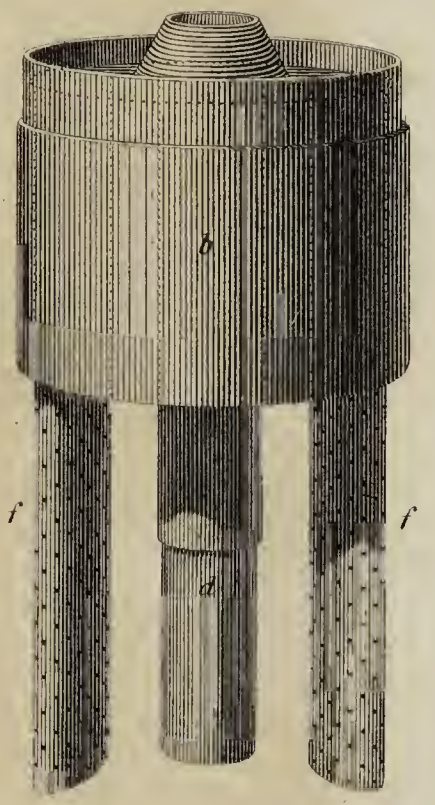



Fig. 1.

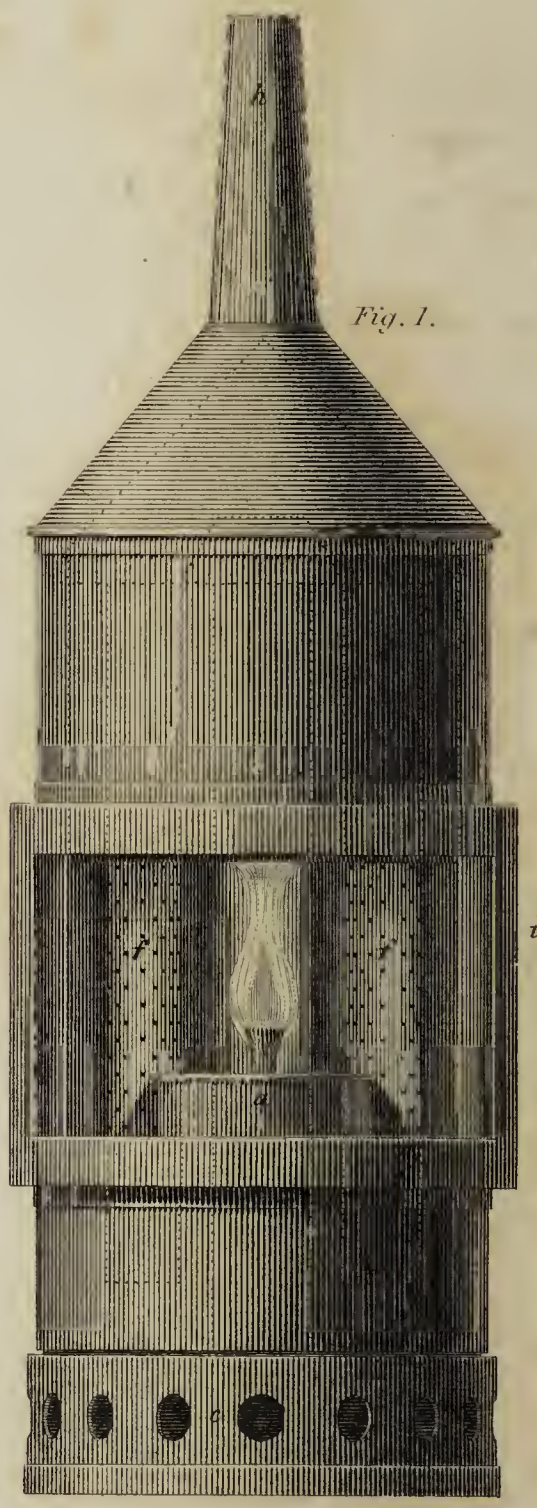



Fig. 7.

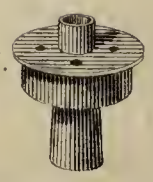


Fig. 6.

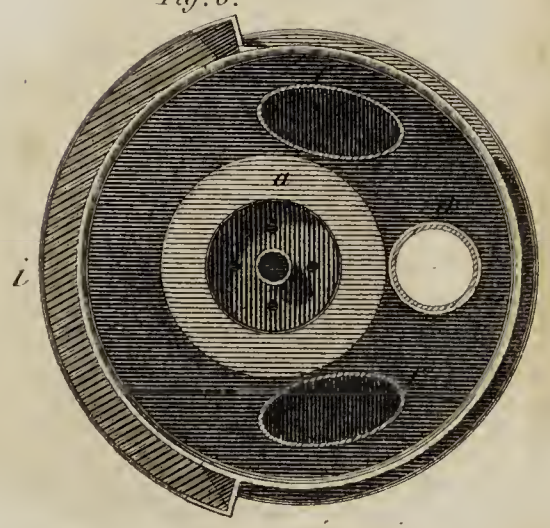



Fig. 8.

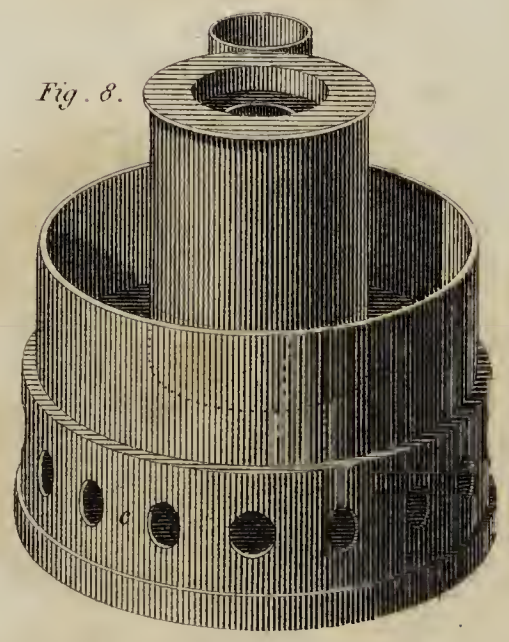
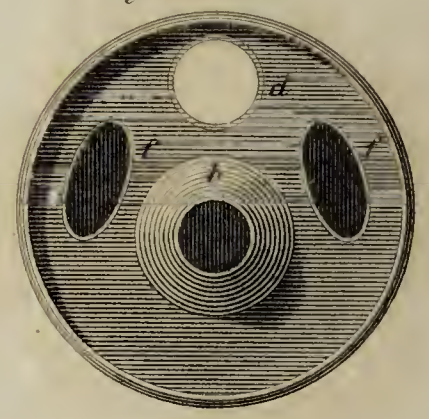
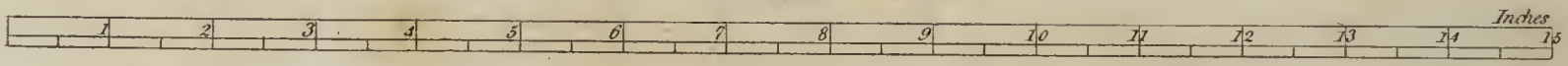



Fig. 4.




Drawn by J. Clement.

Engraved by G. Gladwin

must confess that it far excels any way of drying mahogany I ever saw: as regards the originality of the process, I can only say, although I have been in the cabinet business between twenty and thirty years, I never heard of steaming mahogany to dry it, till you informed me of your invention.

I am, Sir,
Your obedient Servant,
HENRY BROWN, Cabinet-maker.

*No. 96, Curtain Road, Shoreditch.*
*May* 1, 1817.

To Mr. CALLENDER, &c.

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*The* GOLD MEDAL *was this Session voted to* W. R. CLANNY, M. D. *of Bishopswearmouth, Durham, for a Steam Safety-Lamp. The following Communications were received from him, and one of the Lamps is preserved in the Society's Repository.*

SIR,

I HAVE the honour of transmitting you one of my steam safety-lamps, and a copy of my pamphlet on safety-lamps, for the inspection of the Society of Arts.

From the multiplicity of experiments which I formerly made with fire-damp, upon a large scale, at the neighbouring collieries, I am happy to report to the Society of Arts, that steam is an admirable preventive of explosion; and in this I am corroborated by other experimenters who have lately

lately made similar trials with carbonated hydrogen and steam *.

My steam safety-lamps may be constructed of any size, from eight inches in height, to more than three feet; and, when much light is required the lamps should of course be made large, such as those in use at the Painsher engine-pit, of which some account will be found in the inclosed Certificate of Mr. Wood, the viewer.

In these lamps the steam is constantly extricated, and in considerable quantity, which not only keeps the whole apparatus cool, but is likewise an excellent medium for causing the fire-damp to burn silently, and without explosion at the wick of the oil-lamp, as Mr. Wood has stated in his Certificate: such is the strength of light afforded by these lamps, that it may be thrown to a considerable distance by a mirror or mirrors in those parts of the mine where there may be such a scarcity of oxigen that no light could be supported, and where the pitmen have hitherto carried on their work in darkness, as is often the case in coal-mines. These lamps have given a clear light for sixteen hours, without trimming or a second supply of oil, as the workmen of the Rainton colliery, near the city of Durham, have informed me. I might say much more upon this subject, but shall leave the rest to the investigation of that illustrious body into whose hands I commit the result of much exertion, anxiety, and trouble. Mr. Easton, viewer at Birtley in this county, has authorized me not only to mention his name, but to refer any gentleman to him who may be desirous of ascertain-

* Vide Philosophical Magazine for Dec. 1816; Annals of Philosophy, Vol. 9, p. 152, &c.

ing

ing his opinion of the value of these lamps, which he has had in use under his eye for some time.

I am, Sir,

Your most obedient, very humble Servant,

W. REID CLANNY.

*Sunderland, April* 2, 1817.

To A. AIKIN, Esq. SEC.

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*Extract of a Letter addressed to* G. D. MIDGLEY, *Esq. one of the Chairmen of the Committee of Chemistry.*

——— I BEG to remark, that the water should be put into the cylinder of the steam safety-lamp at the boiling point, and that the lamp is so constructed, that the flame keeps the water always at the boiling point, and thereby extricates an abundance of steam under all circumstances, as has been clearly proved by the constant use of these lamps at the Painsher engine-pit for several months, and in several other collieries where there are considerable quantities of fire-damp. I acknowledge that I did not anticipate any objection to these lamps on the score of safety, after so many months' severe trials in different highly explosive collieries.

Three months ago, I accompanied Mr. EASTON, an eminent viewer in this county, and a few workmen, into a large cavern of fire-damp, in the Gateshead park colliery, and observed, that the flame of the lamp was silently extinguished by reason of the great quantity of fire-damp, and consequently inferior proportion of atmospheric air which we found in this cavern. After all, should any doubts still remain, I beg to say, that I will myself take my steam safety-lamp into any colliery

colliery in the United Kingdom, let the fire-damp be ever so pure or so great in quantity, at any time and in any manner which may be desired; for such is the value of steam, that in no case and under no circumstances can any accident ever happen from fire-damp, when it is so used as a preventive of explosion.

W. REID CLANNY, M. D.

*Sunderland, May 14th, 1817.*

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CERTIFICATES.

I CERTIFY that fire-damp is frequently discharged at the engine-pit at Painsher colliery, and that no light has been taken into this pit for upwards of two years, till the engine-wright took Dr. CLANNY's original water-lamp into it about eight months ago, which permitted him to examine that pit in every part, and to make his report accordingly. The shaft of this pit now requires to be repaired, and Dr. CLANNY's original safety water-lamp was taken into it, when it burnt very bright for four hours, but the workmen having occasion to come to bank, when they went down with the same lamp again, after using it for about half an hour, the fire-damp exploded within this lamp, and with the greatest safety. The engine-wright took down Sir H. Davy's wire gauze lamp, which he had carefully trimmed with the best oil, and to render the matter as certain as he could, being very desirous of having a light in this pit, he placed the wire gauze lamp in an an old lanthorn (which had the glass taken out) in order to screen it from the wet, and descended the said pit; but the lamp went out, although he took the greatest care possible from his wish to have a light in this pit when at work: the trial was afterwards made in the same way,

way, but it turned out equally unsuccessful, so that Sir H. Davy's lamp could not be made to burn in this pit, although the greatest care was taken to make it do so. Dr. CLANNY's steam safety-lamp, in its present improved state, was then tried, which gave the workmen a clear and very brilliant light in all parts of the engine-pit, and for any length of time that they wished; for it has never gone or been put out since they put it to use, and, from the increased size of the flame at the wick of the lamp, which frequently occurs, there is no doubt but it burns the fire-damp, which is of the greatest importance, and, from the steady and permanent light which it affords, the workmen are enabled to get rapidly forward with their work.

JOHN WOOD.

*Painsher Colliery, September 10, 1816.*

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*Newbottle Colliery Office, June 5, 1817.*

DEAR SIR,

I AM glad to inform you that we have had your steam safety-lamps in use at the above colliery for some time past, and that the head wasteman and others who travel the old working with him are well satisfied with the utility and safety of the same; and also they state to me that they are not afraid to pass through the most inflammable part, should they meet with it in their travels. Likewise they say, the brilliant light which shines from it far exceeds the naked flame of our small candles which we use for working the coals, which makes the said lamp very useful indeed. Also they say, after the wick is lighted it will burn for eighteen

or

or twenty hours without snuffing, or any supply of oil or water to it.

I am, Dear Sir,

Your most obedient Servant,

ANDREW WATSON.

To Dr. CLANNY.

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DEAR SIR,

YOUR steam safety-lamp (for the use of coal mines) that I experimented upon answered fully to my expectation; gave a very good light, was in a variety of mixtures of air, which did not at all affect it, until it was immersed in pure carburetted hydrogen, when the light was extinguished.

From the time you made some slight alterations in the lamp, and returned it as a present to the colliery, it has not been tried, the colliery not being in a situation to require the use of any safety-lamp

I remain, Dear Sir,

Your's sincerely,

THOMAS EASTON.

*Birtley, June 6,* 1817.

To Dr. R. CLANNY.

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*Reference to the Engraving of Dr. Clanny's Steam Safety-Lamp, Plate* 1.

*a*, The cylinder which holds the oil and the wick. The piece through which the wick passes (fig. 7) is received into the socket of the cylinder, which is purposely made deep,

in

in order that as little as possible of the wick may be consumed, and thus the necessity for frequent snuffing may be avoided.

*b*, The boiler, filled with hot water and kept in a state of ebullition by the heat from the flame of the wick placed directly below it.

*c*, A row of holes surrounding the base of the lamp, through which the air enters.

*d*, A cylindrical tube, which conducts the air that has entered through *c* into the cover of the boiler. It supports the boiler, and is composed of two pieces fitting closely on each other, but capable of being separated for the purpose of detaching the boiler with its appendages (fig. 5), in order to fill or empty it.

*e*, The cover of the boiler, shewn by itself (fig. 3), within which the mixture of the air and steam takes place.

*f f*, Two tubes passing through the boilers, and perforated at their lower extremities, in order to convey the air mixed with steam into the body of the lamp.

*g g*, A space between the lamp and its case, through which the air that has been burnt passes into the chimney *h*.

*i*, The window made of clear glass half an inch thick.

*k*, The handle.

Fig. 1, is a front view of the lamp, the whole outer case of which is made of strong tinned iron, except the window.

Fig. 2, is a vertical section of the same, at right angles to fig. 1.

Fig. 4, a view of the top of the boiler and its appendages, the cover being removed.

Fig. 6, a horizontal section of the lamp through the middle of the window.

Fig. 8, the cylinder to hold the oil and wick, shewing

the depth of the socket which receives the piece, (fig. 7); behind it is the air tube, *d*.

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*The* SILVER MEDAL *and* TEN GUINEAS *were this Session voted to Mr.* THOMAS STILES, *of Norwich, for his method of preparing an Extract of Sprats. The following Communication was received from him, and Samples of the Preparation are preserved in the Society's Repository.*

DEAR SIR,

THE attention shown by you in the case of my method of curing herrings in 1813, induces me to hope that you will give me an opportunity of presenting before a Committee of the Society an invention which, after much labour, has been crowned with success. I have submitted it to the inspection of competent judges, one of whom is industriously communicating the utility of it to the circle of his acquaintance. My friend, William Spratt, Esq., of the city of Norwich, will have the honour of presenting to you a sample of Essence, liquid and solid, prepared from my cured fish. These articles can be produced in any quantities, should the public receive them with the same avidity as the individuals within the circle of my acquaintance. It is equally suitable for foreign and home consumption, being so highly charged with preservatives as to warrant its keeping in any climate. I need not enlarge on the utility of this invention as you have the article before you, which will plead

plead my cause. The Essence herewith sent is prepared from fish of my curing in November, 1813, which are now as bright as they were on the day of pickling, of which I have several cwt. now by me.

I am, Dear Sir,
With every mark of respect, yours,

THOMAS STILES.

*Norwich, September* 16, 1816.

To Dr. Taylor, Sec.

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The process by which Mr. Stiles makes his liquid and solid Essence of Sprats is as follows:

He commences by salting and curing any quantity of sprats, according to the method described in the 31st Vol. of the Transactions of the Society. He then pours the sprats with their liquor into a copper, and brings them to a boiling heat; after which they are put into hair bags and strongly pressed. The liquor thus obtained is put into a vat or any other convenient vessel for a few days, till the oil has risen to the surface; the oil is to be removed very carefully, and the remaining liquor (called by Mr. Stiles *Essence)* will be found to be wholly free from the coarse peculiar flavour of the sprat, and to be scarcely distinguishable from the essence of anchovy.

In order to prepare the solid essence, he takes a quantity of wheaten flour and carefully dries it in a water bath for the space of 60 hours, the lumps being then broken to pieces he mixes it well, by hand, with the liquid essence till the mass is about the consistence of cream, adding at the same time a little bole armenic to give it a red colour. He

then reduces the mass by farther evaporation in a water bath, stirring it constantly with a wooden spatula till it has acquired the consistence of butter; the preparation is then compleat, and is packed in barrels for sale.

PAPERS

Fig. 1.

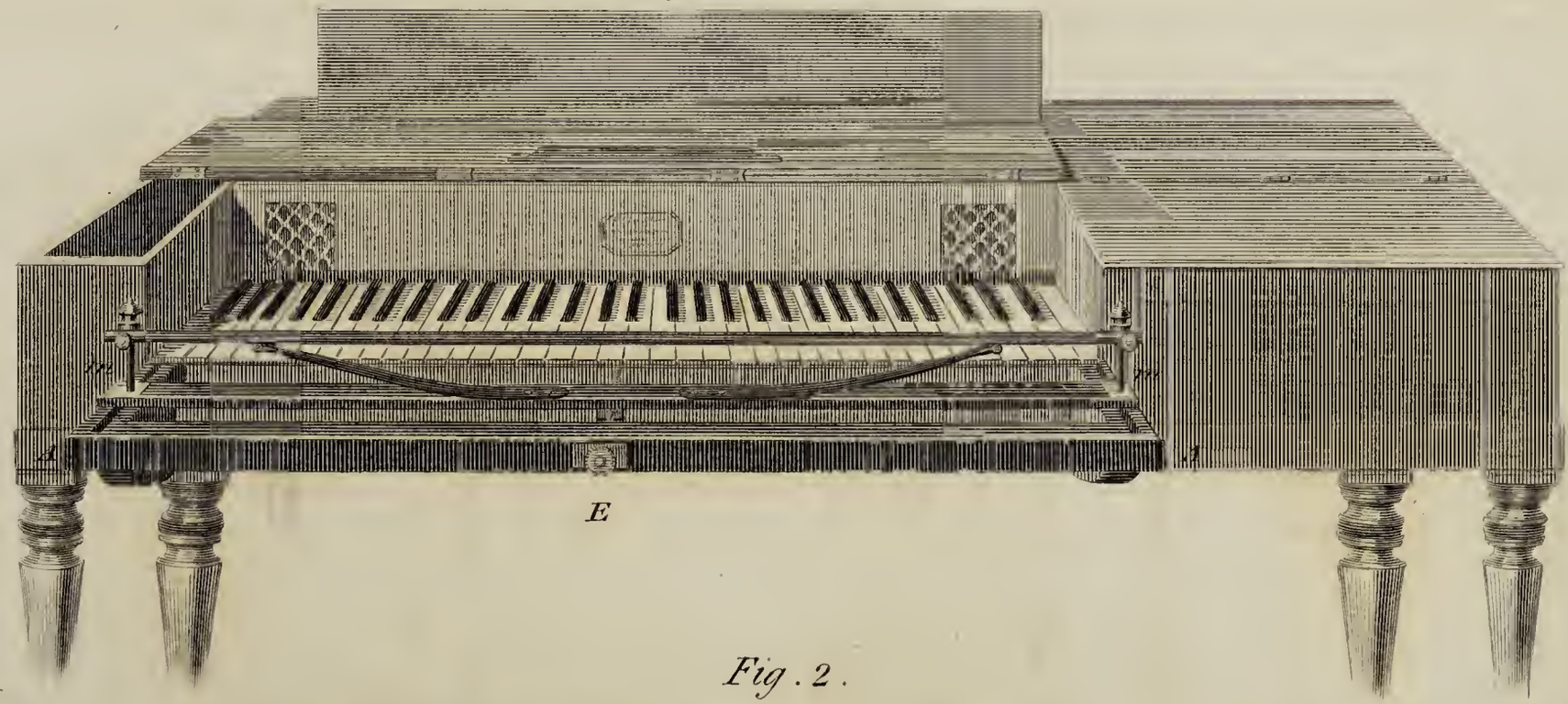
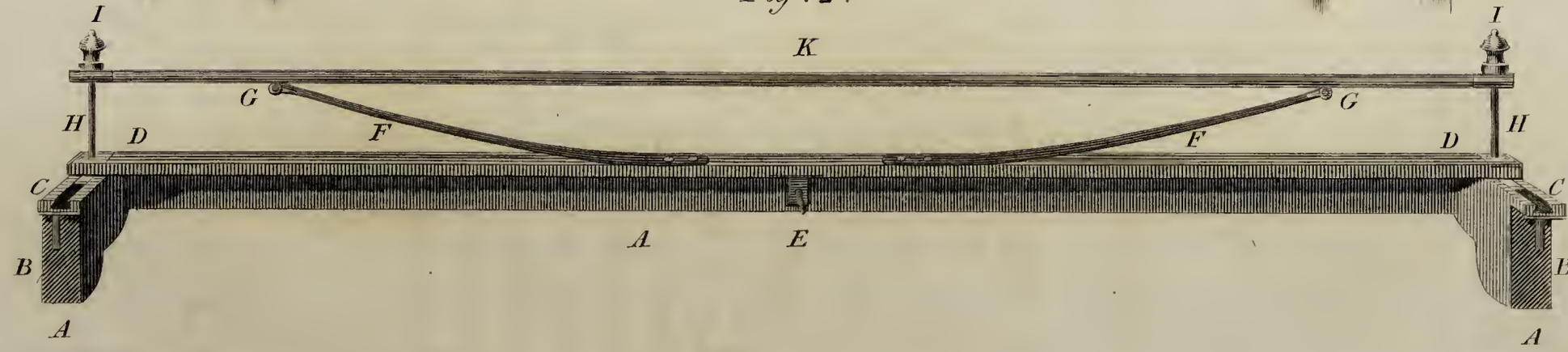



Fig. 2.




Drawn by M. A. Warren

Engraved by A. W. Warren

# Mrs. M. A. Warren's Piano Monitor.

# PAPERS

IN

# POLITE ARTS.

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*The* SILVER MEDAL *was this Session voted to Mrs.* M. A. WARREN, *of Glasgow, for a Piano Monitor. The following Communications were received from her on the subject.*

SIR,

HAVING for many years practised music as a teacher, my inclination and duty have led me to try every improvement that presented itself within the scope of my imagination, not only to inform my pupils of the principles which lead to the science of music, but also to form their habits so as to direct their practice to the attainment of its object: I need not, nor can I, perhaps, describe the methods pursued by different teachers with various success, whilst some have proved very prejudicial, and laid the foundation of errors fatal both to principle and execution.

To correct these errors (which generally arise from improper methods, or negligence when commencing with young beginners) has engaged a portion of my attention.

One of the greatest faults in execution I have had to combat was weakness in one or both wrists, occasioned often by inattention in the teacher; sometimes from stubbornness or indolence in the pupil, no matter from whom or whence the fault is derived, all the first teachers agree in considering it as fatal to the attaining any degree of perfection on the piano forte. To provide against the failing I have alluded to, and to assist both the teacher in conveying, and pupil in gaining the necessary and elegant command of the instrument, I have attempted to construct an assistant for the wrist, which I have named the Piano Monitor.

With the greatest diffidence I present it to the Society of Arts for their inspection. The conviction I have of its utility, from the success with which I have applied it, gives me reason to hope it will in some degree be found worthy their attention. I must apologize for the want of mechanical knowledge it doubtless will exhibit, by urging that studies of this kind seldom form any part of female education. I have endeavoured to render it simple, so that a child can regulate it, which I conceive a very essential point to gain. Its construction, no doubt, can be much improved by those better versed in mechanics; yet, feeling assured of its usefulness, I hope my humble exertions will be of service to those who teach, or learn music, on the piano forte.

Any further communications which may be thought necessary, will be readily attended to by,

Sir,

Your humble Servant,

MARY ANNE WARREN.

*83, Thougate, Glasgow.*

To A. Aikin, Esq. Sec.

*The*

*The Application of the Piano Monitor.*

Having before stated the errors which render the invention necessary as a remedy or preventive, I have only to add in what manner I have applied it to assist my pupils in conquering or avoiding the faults incidental to the wrists.

In using it with beginners I find it gives them a steady and even touch; it pitches their wrists to that height which enables them to execute with firmness, and by its having a spring, does not in the least deprive them of that expression and grace which an unmovable rail would contract. I generally pitch it at that height which will allow them to play over it without touching the rail, except in striking an octave. Should they rest upon it, or attempt to strike the keys too harshly, the spring informs both teacher and pupil of the error, and by keeping the wrists in their position, saves trouble to the teacher, whose attention can be directed to other material explanations. The spring is more constant in its attendance than the teacher, being always present to assist their practice, when the absence of the teacher might occasion a relaxation of attention in this particular point. Should a young hand be heavy or stubborn, the screws, *m m*, fig. 1, will fasten one or both ends, so that it will not recede from the pressure of the hand, and will oblige the wrists to keep their height; the Monitor is likewise of great use to those who, whilst advancing in theory, had been allowed in their practice to contract a weakness in their left wrist: for the Monitor rail can be fastened at the left side, whilst the other end is allowed to spring. The Monitor rail can be placed at any distance from the keys by the screw E, keeping the ends parallel to each other with the

hand. I had two screws similar to E, one in each of the dove tails C C; but the Monitor appeared too complicated, and I found that one answered the same purpose, and was much better calculated for juvenile comprehension; other methods might be devised for fixing it on the instrument: I have made choice of that which I thought the most simple, as the holes for the pins are but small, and will not injure a piano forte.

The Monitor can be put on and taken off in an instant. I wish it to be particularly observed, it is not intended that the learner should always practise with the Monitor. The great advantage to be derived from its use, is the proper position of the wrists, which if once attained will not easily be lost, as the wrist, being kept up, the sensitive part of the finger will touch the keys, when the Monitor is removed. The finger will necessarily touch the keys with the same part, consequently the wrist must take the same position without, as it was accustomed to with the Monitor.

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*Reference to the Engraving of Mrs.* WARREN'S *Piano Monitor.*

Plate 2, fig. 1, represents the Monitor fixed on the piano. Fig. 2. The Monitor detached from the piano, and viewed in an opposite direction to fig. 1.

A A A, A frame of wood, which is fixed on the piano by means of the pins, B B.

D D, a bar of wood, forming the base of the Monitor, and traversing by means of two dove-tail pieces, in the grooves, C C.

E, A screw working in a collar, and passing through both

# Mr. Dick's machine for drawing in Perspective.



Fig. 1.

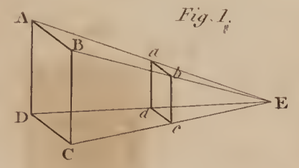



Fig. 2.

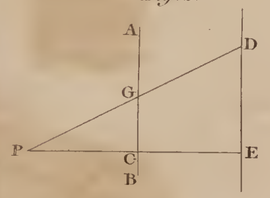



Fig. 3.

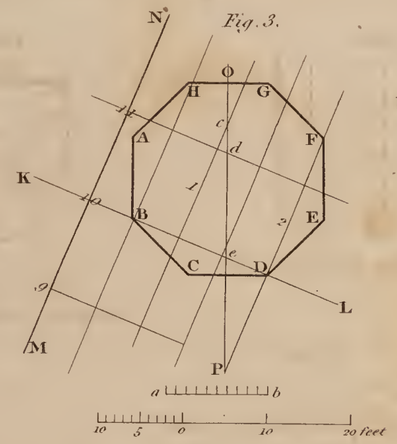



Fig. 4.

Fig. 6.

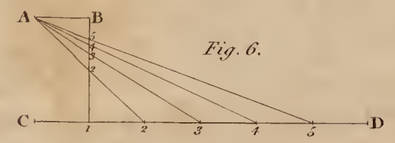



Fig. 10.

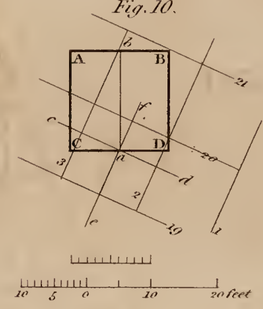



Fig. 8.

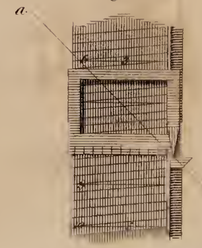



Fig. 7.

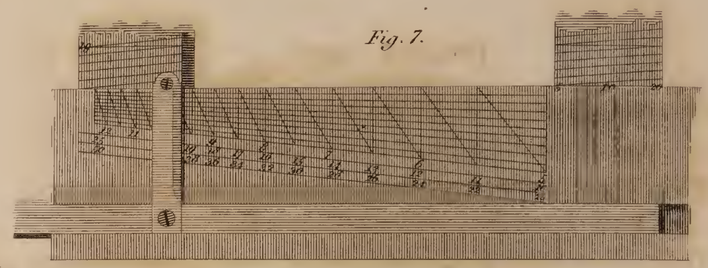


Fig. 12.




Fig. 13.




Fig. 5.

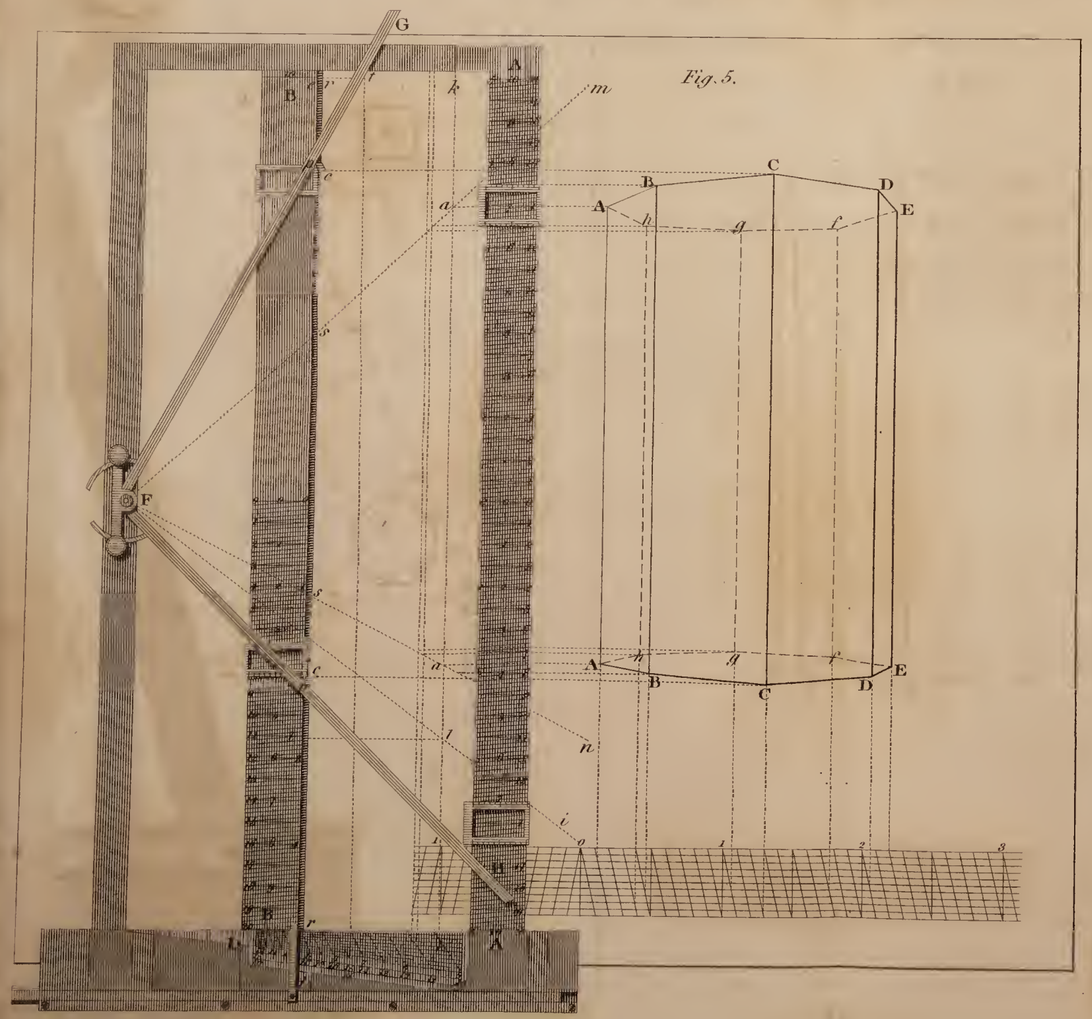



Fig. 9.

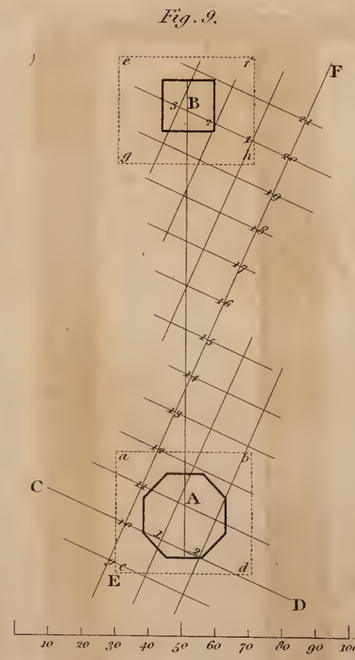
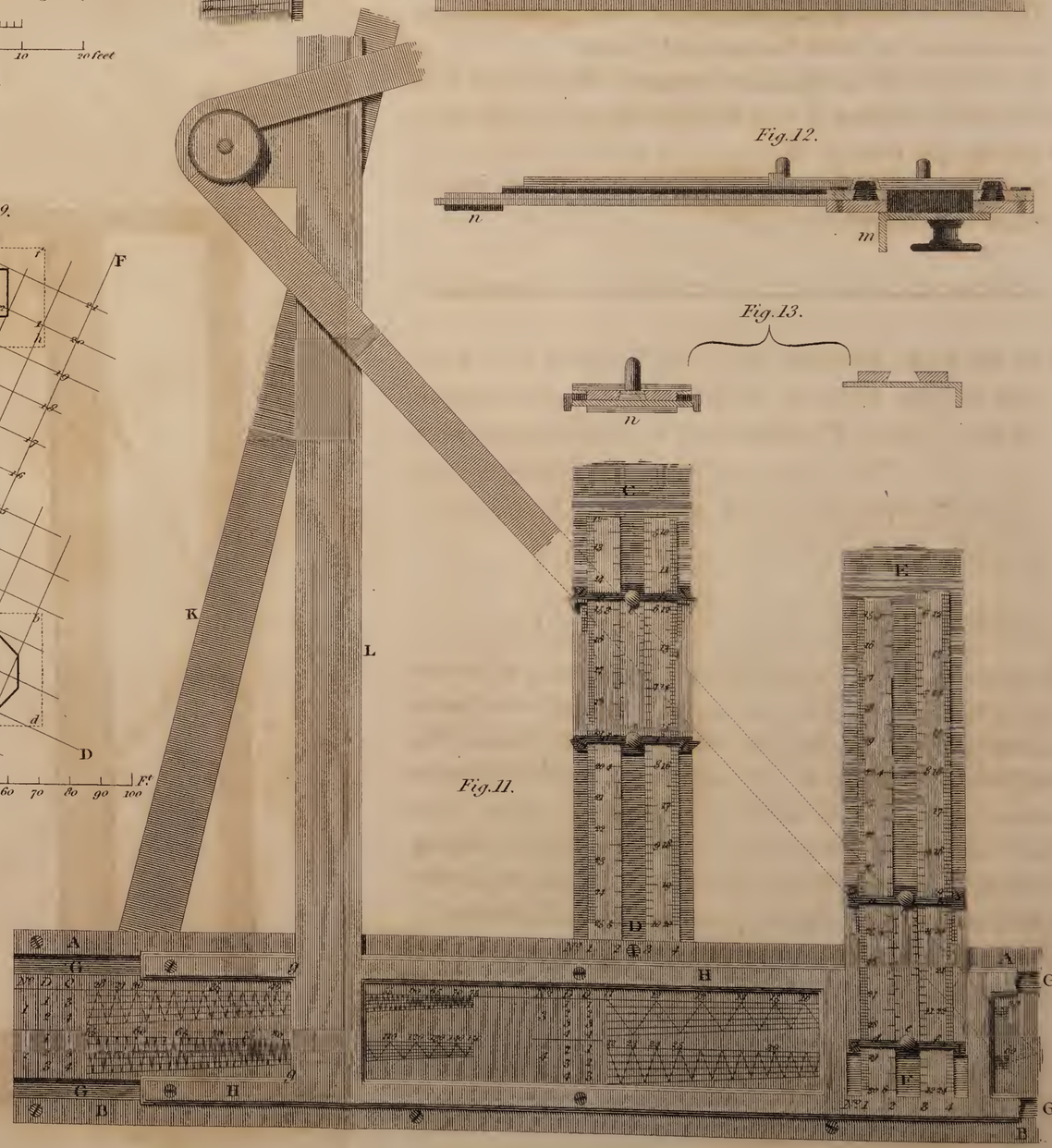



Fig. 11.




Edn.d Turrell Sculp.

both A and D in order to fix the Monitor at any convenient distance from the keys of the piano.

F F, Two steel springs fastened by screws into the bar, D, and terminated by small rollers, G G.

H H, Two brass pins terminated at their upper extremities as screws, on which the nuts, I I, work.

K, The rail of the Monitor terminated at each end by a brass ferrule, perforated so as to allow the rail to slide easily on the upright pins, H H.

*m m*, fig. 1. Small screws, by which the rail may at pleasure be rendered motionless.

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*The* SILVER MEDAL *and* TEN GUINEAS *were this Session voted to Mr.* D. DICK, *of Vauxhall Walk, for an Instrument for Drawing in Perspective. The following Communications were received from him, and one of the Instruments is preserved in the Society's Repository.*

SIR,

ACCORDING to the usual mode, and on account of its simplicity, perhaps the best method of perspective for architectural purposes, a separate table or board, beside that used for the drawing, is required for finding the points on a ground line equal in extent to the picture; so that, even when those useful instruments for drawing lines converging to distant or inaccessible centres are applied, the whole side of an apartment is frequently occupied by one drawing, it being requisite while the projection is going forward, to

have

have the plan, with the ground line upon it at hand, to be referred to as found necessary.

Another, and perhaps worse subject of complaint, is the great number of superfluous lines, which must unavoidably be used in finding those which really belong to the picture, and that tend so much to perplex the artist, particularly beginners. Having turned my attention to the means of lessening or removing these inconveniences by some mechanical contrivance, and having succeeded in making an instrument which compleatly answers the purpose, I beg leave to submit it to the consideration of the Society for the Encouragement of Arts, &c. being persuaded that, if adopted, it will be found of considerable service to artists, particularly for pictures at long distances, or when different buildings, lying at considerable distances from each other, are to be represented in the same picture; as they can all be projected by means of the instrument, without being brought into connection in one general plan; and the perspective representations can be made greater or smaller at pleasure, whatever the extent of the plans may happen to be.

In its principle and manner of operation it is so simple, that any one possessing a moderate knowledge of geometric drawing, though entirely unacquainted with the rules of perspective, may learn to use it in half an hour's application, in the projection of the most difficult buildings; and it possesses this singular advantage, that the whole projection may be made by it without putting a line upon the paper which does not belong to the picture. In point of expedition, I believe it will not be found inferior to the most simple method in use, when a facility in working it and in reading the scales has been acquired; and I am persuaded that the accuracy will be found greater with a well made

instrument.

instrument.—That which I have the honour to lay before the Society, it may be proper to state, is rather defective both in execution and construction, having been made and divided by a person who is not a professed mechanist, and without the proper apparatus and implements for such work.

I have, however, proved its powers by projecting several drawings with it, requiring great accuracy, and found it to answer the purpose, imperfect as in many respects its execution is, with as much accuracy as would have been obtained by any other method.

As the invention opens a new, and in all probability an improvable path to the artist, it is submitted in the hope that it will be found, in some degree at least, worthy of the consideration of the Society.

I am, Sir,
Your obedient humble Servant,
DAVID DICK.

*No. 5, Vauxhall Walk, February* 22, 1817.

To A. Aikin, Esq. Sec.

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*Explanation of the principle which is employed in using the Instrument.*

A perspective representation of any object, it is well known, is the representation of a section of the rays of light, proceeding from the object to the eye of the spectator.

The principle on which such a section, or representation can be made from geometrical projections of the object, is deducible from the doctrine of similar triangles, and may be briefly expressed as follows.

If the rays proceeding from any plane to the eye be intersected by another plane parallel to the first, the corresponding lineal dimensions of the section and original plane will be to each other in the distinct ratio of their distances from the eye.

Thus, suppose A B C D, plate 3, Fig. 1, to be a plane, A E, B C, &c. rays proceeding from it to the eye, E, and *a b c d*, a section of the rays parallel to the plane, A B C D; then, the section and plane are similar in every respect, and the corresponding lines in each, viz, *a b*, A B; *b d*, B D, and *c a*, C A, are to one another, as the distances of their respective planes from E.

To shew in what manner this obvious principle can be applied in the projection of perspective pictures from geometrical plans of objects, let D, fig. 2, be any point in a plane of which D E, is a section, or edge view, P, the point of sight, and A B, a section of the picture plane. From P draw P C, perpendicular to A B, produce it till it meets D E in E, join P D, and the line will cut the picture in G. From the construction it is plain that, P E D, P C G, are similar triangles; consequently P E: P C: E D: C G. Now suppose that P E and D E, which are variable quantities, have been measured in parts of P C, the distance of the picture, which make $\frac{1}{2}$ or unity, and that they have been found P E=2, D E=1, then as before, 2 : 1 : 1 : 5, or simply, $\frac{1}{2}$ = ·5, which shews that the place on the picture of the point D, is five-tenths of P C, distant from the centre, C. In the same manner the place on the picture of any other point in the original plane might be found; or of any other point whatever, of which the distance from the picture can be ascertained, for that distance, together with the known distance of the picture, will be the distance from the eye of a

plane

plane supposed to pass through the point parallel to the plane of the picture.

Consequently, having drawn the ground line and a perpendicular to it through its centre, as K L, M N, fig. 3, upon any plan which is to be put into perspective, and having determined the distance of the picture or ground line, it is only necessary to measure in parts of that distance, the distances from the ground line and from its perpendicular, of those points on the plan which are to appear in perspective, and to divide the distances from the perpendicular by the distances from the ground line, added to the distance of that line from the point of sight, in order to find the places of the points on the picture.

Thus, in fig. 3, the distance of the point E, of the plan A B C, &c. from the ground line K L, is ·08; that is, eight one hundredths of the distance of the picture, and from the perpendicular M N, ·238. Adding unity to the first of these numbers therefore we have ·238. divided by 1·08, to find the place on the picture of the point E, which is accordingly ·22 parts of the distance of the picture from its centre; and it is so represented in the perspective projection, fig. 5, the angle E E, being over the division ·22 of the scale below.

The above is the general principle on which the instrument is made to act; it performs the operations in division with great expedition, and at the same time, by a proper relation being preserved between the scales thereon and those adapted to the plans and picture, determines mechanically the points in perspective.

As this sort of explanation, and the use of numbers in the process, give it an appearance of complexity and difficulty which do not belong to it, it is necessary to observe, that the mind has nothing whatever to do with calculations

of

of any kind, in using the Instrument, there being nothing more required than a readiness in reading the scales thereon, and adjusting or setting it by them.

*Description of the Instrument, and Explanation of the manner in which it performs the operations in division.*

It is represented in figure 5, as lying on a board, in the manner of a T square. The perspective representation of the octagonal prism, may, for the sake of illustration, be supposed to have been projected by the instrument, as in reality it was by means of the figure.

The upper side on which the scales are engraved is brass, the under side is wood, and the whole thickness about two tenths of an inch. The edges of A A, and those of B B, are made parallel to one another, B B, is the blade of a T square, the stock of which is made to slide evenly in a groove, in the bottom of the frame, so that the scale B can be placed any where between the scale A, and the centre F, on which the two limbs, F G, F H, are moveable. The inner edges of these limbs are straight and cut the centre F, or world cut it if produced.—The points *p*, of the sliders on B, and the edge of the plate *d*, which is moveable with B, areall in a line *d e*, parallel to the edges of A. The nature of the scales, A and B, or the dividend and quotient scales, as, from their respective uses, they may be termed, will be seen at once by an inspection of the figure, but it will be necessary to add a short explanation of the nature of the divisor scale D.

For this purpose let A B, C D, fig. 6, be parallel straight lines, one of which C D, is unlimited towards D, and its extremity C, perpendicular under A; B 1 a line falling on both atright angles to them, and 1, 2, 3, 4, &c. distances on C D,

each

each equal to A B. or C 1. Then will the intersections of the lines, A 2, A 3, A 4, and so on, with B 1, in the points 2, 3, 4, form a scale on the same principle as that on the bottom of the Instrument, and similar to a vanishing line in a perspective picture; for, supposing A a point of sight, B 1, a vanishing line, and B the vanishing point of the line C D, the points 2, 3, 4, &c. on B 1, are the projections thereon, of the original points, 2, 3, 4, in C D.

Had this scale been continued on the Instrument to 100, taking the number by the middle line, it would have been complete, or at least would have included all the objects; but the divisions towards 100, would have become too small, and in numerous cases only two places of figures would have been obtained in the quotients, when, for the purpose of drawing accurately three are necessary. As the scales are now arranged, three figures in the quotients can always be obtained, and very often four.

There are three lines of numbers on each scale, which for the sake of description, may be distinguished by first, second, third, from left to right on the dividend scale A, from right to left on the quotient scale B, and downwards on the divisor scale D. The divisions are read for these different lines, thus: On the first line, on A, or B, there are 20 divisions, made by oblique lines, from 0 to 1·0, and from 1·0 to 2·0, and so on, two of these oblique lines, therefore, are a tenth of a primary division; and two of the divisions on the sliders, the edges of which intersect the oblique lines, are a tenth of a secondary, or a hundredth of a primary division, the oblique lines being divided into tenths, by the divisions on the sliders. On the second or middle lines, the primary divisions are plainly divided into tenths, by the oblique lines, and these again, into tenths by the divisions on the sliders—on the

the third line, the half of each oblique division, or five divisions of the slider, is a tenth of a primary division, and the half of each tenth on the slider, is therefore the tenth of a second division. The divisions on the divisor scale are reckoned in a similar manner.

To set the Instrument, place the edge of the plate *d*, to the division,or number required as a divisor, and the slider on A, to the dividend ; set the edge of the limb to the corner of the slider, and while it is held in that position, make the point *p*, of the slider on B, rest or bear upon its edge, then turn it aside, and the edge of the slider will be found cutting a division on B, at one of its own divisions, and these taken the one after the other, will be the answer.

Thus in fig. 5, it is represented set as described. Taking the middle lines of numbers, the divisor is 193, the dividend 800, and the quotient 414. The divisor and quotient will be more distinctly read on figures 7 and 8, which are parts of fig. 5, enlarged. On fig. 8, the line *a b* stands for the edge of the limb, touching the resting point of the slider, the dividend edge of which appears to have passed 4 of the primary, and 1 of the secondary, divisions on the scale ; while it has little more than 4 of the divisions on itself cut by another of the oblique lines of the scale; the quotient is therefore, taking these figures in succession, 414, and a little more.

The general rule for division is as follows: First.—If the divisor be taken on the first line of D, the dividend may be taken on either the first, or second lines of A. If it be taken on the first, the quotient will be found on the second, or middle line of B. If it be taken on the second, the quotient will be found on the third.

Second.

Second: If the divisor be taken on the middle line of D, the dividend may be taken on any of the three lines of A, and the quotient will be found on the corresponding lines on B.

Third: If the divisor be taken on the third line of D, take the dividend on the second or third lines of A. If it be taken on the second, the quotient will be found on the first line of B. If it be taken on the third, the quotient will be found on the second.

From this it follows, that each set of the Instrument gives solutions, to seven distinct questions in simple division. By attention to the rule, and to what has been stated above, respecting the divisions of the scales; any of the remaining six questions will be found solved on the figure, similarly to the example given above.

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*Example of the application of the Instrument to perspective, with the method of preparing the plans and pictures.*

Suppose that figures 3 and 4 are the plan, and elevation of an octagonal solid: Let K L, fig. 3, be chosen as the ground line, and draw through its centre the perpendicular M N,—then, having determined on the distance of the picture, set off tenth parts of it on K L, on one or both sides of the centre as may be necessary, as 1 2; and on M N, as 9, 10, 11, and through these points draw parallels to K L, M N, as in the figure. On any line *a b*, divide a tenth of the distance of the picture into ten or one hundred parts, for a scale to measure the situations of the points between the parallel, and thus the plan will be prepared.

It will readily appear that lines, parallel to the ground line and to its perpendicular, may be put upon a plan lying at any distance from these primary lines, and by having

their proper distances marked upon them, like the degrees of latitude and longitude on a map, they will answer equally well to measure from as the originals themselves; hence the application of this method, with the same facility and convenience, to plans of any extent, or to more than one.—An example will afterwards be given of the manner of finding the parallels for distant plans.

The paper on which the drawing is to be made, must now be prepared with a scale parallel to the horizon. One similar to that in fig. 5, will be easily made to great accuracy. Its parts may be made greater or smaller than those of the plan scale, according as the picture is required to be greater or smaller.

Then try with the compasses how many parts of the picture scale any number of the principal divisions of the scale A or B, of the instrument are equal to. In this case, ten divisions of the instrument are equal to three divisions of the picture scale. Extend therefore on any straight line, as *a b*, fig. 4, three parts taken from the plan scale, or three tenths of the distance of the ground line, and divide that distance into ten, the same number of parts as were taken at first from the Instrument, and by this scale measure the heights on the elevation above or below the horizontal line H O. Had the elevation been drawn to a different scale from the plan, the scale now described must have been made in proportion to the difference.

As the points or angles B and D, of the plan fig. 3, lie in K L, the ground line, it is only necessary to take their distances from the centre by the scale for the plan, and to set the ruler *r r*, of the instrument, to the corresponding points ·046 for B, and ·205 for D, on the picture scale fig. 5; then, as many parts as the elevation is found to measure by its scale

*a b*,

*a b*, above and below the horizontal line H O, make B B, D D, by the Instrument, above and below its centre division, or the zero of the scales, A or B, and the projection of these two angles will be done.

Next, the situation of the angle, A, fig. 3, will be found by the scale to be ·012 from the perpendicular, M N, and ·08 from the picture, K L, that is, 1·08 from the point of sight; therefore, set the plate *d* of the instrument to 1·08 on the divisor scale D, and let the dotted line, *k k*, represent the edge of the scale B, or the line *d e*; then set the lower limb, as represented by the dotted line F *i*, to 12 on the third dividend line, and *l* will be the place where the bearing point *p* of the slider would touch the limb, while its edge represented by, or in the line *l l* would cut on the third line of B, the number 111 agreeably to the rule: then, either supplying the decimal places in the mind, or observing the distance of the point from the centre line on the plan, the result obtained will show, that the ruler *r r*, is to be set to ·0111 of the scale under A A. Here it is obvious that only two of the figures of this quotient are required, or can be used.

The limbs are then to be set for the heights, to 7·5 above, and 4·0 below the zero of the scale A, by the middle line, these being the measures on the elevation fig. 4, above and below the horizontal line H O, by its scale *a b*; F *m*, F *n*, represent the limbs set to the heights and intersecting *k k*, in *a a*, or the places where the bearing points of the sliders would rest against the limbs; this being done, the stoppers, *c c*, will limit the length of A A, the perspective projection of that angle, which may be drawn with a pencil or pen between the stoppers, while the ruling edge *r r* is kept at the point of the scale previously found. The other angles, F,

F, G, H, are projected precisely in the same manner, but the divisor for the the angle C being on a different line from the divisors of the other angles, another line on the dividend scale must therefore be used for the heights, as these are always to be taken on a line of A, corresponding to the line on which the divisor is taken on D, for the edge *d e* being set to the divisor 966 by the first line on D, it is plain that the former positions F *m*, F *n* of the limbs, will not as before answer for the heights, as the points of intersection *s s* will show; the limbs are therefore set to the heights on the first line of A. The scale not extending far enough for the height above the horizon, set *d e* to *t t*, or to 75 on D; put the slider up to 10, and rest the edge of the limb against the point *p*, which will then be in the place *t*. Fix the limb in that position by its thumb-screw, and bring down the slider to allow *d e* to be set to the divisor 966, as in the figure; then, as usual, set the bearing point of the slider to the edge of the limb, and its stopper will then limit the true perspective height as before.

It may be remarked, however, that in a case like this, when the height exceeds the numbers on the line whereon it should be taken, its half or quarter may be taken instead, and the perspective height found from that doubled or quadrupled, and this will be as easy to do as the method described above. Thus, F *m*, F *n*, fig. 5, represent the limbs set to half the height, and their intersections *s s* with *d e* are at half the perspective height, which might have been doubled for the whole, and in this manner vertical lines may be found of any length whatever beyond the limits of the instrument, and extended by a common ruler. But vertical lines of a greater length than the instrument readily admits

nits are not often required for architectural drawings in perspective.

Because the limb in the position F *m*, is set to 7·5 by the middle line of A, while it is only at the half of 7·5 by the first line, it is evident, that it is only necessary to take the height on the following line to the true one, when its half is required, or on the next following for its quarter, when that can be done; but, if the divisor were on the third line of D, then the true line for the height would be the third of A, which has no succeeding line. If, however, the height were taken on the line preceding it, then one-fifth would be obtained, which being taken five times, would be the quantity sought. Thus, let 20 be the height by the third line, but let the slider be set to 2 or 20 on the second line, the quantity is evidently a fifth, and the perspective height or quantity would be in proportion; consequently, other heights exceeding 20 could be obtained in this manner.

The example which has been given above embraces every possible case that can occur, after the parallels have been drawn, in making any perspective projection by means of the instrument, but as its accuracy of working may be greatly increased without any more trouble for large pictures with long distances, if the plans be also large, and as the method may be employed with advantage where there are a number of successive small parts to be represented, it may be proper to explain how this can be done.

If the scale for the picture as above described were continued to 10 both ways from the centre, it would include an angle of 90 degrees; but, as 90 degrees, and consequently the whole scale, is never required in any picture, a scale containing the whole number of parts may be made to extend but a little way farther than the perspective representation; for, by measuring the distance of points from the

perpendicular on the plan by a scale proportionally diminished to the picture scale, the dividends would be so much greater, while the divisors would remain the same; consequently the quotients would be higher, and would therefore correspond to higher numbers on the diminished picture scale. Thus, if the scale for the picture was made half the size it is at present, and the distances between the parallels to M N, fig. 3, on the plan, also one half, as shewn by the dotted lines between the former, while the parallels to K L of the picture remain as before, the quotients would obviously be double what they were before; consequently the projection would be made of the same size by a finer scale.

It is to be observed, that this method is merely calculated to lessen the effect of the errors of the instrument, for allowing its error to amount to 1, or unity, in any quotient from 100 to 1,000, (which is an ample allowance if it be well made, and care be taken in using it,) it will just amount to one of the least divisions of the picture scale, or a one-thousandth part, which, as has been seen, can be considerably lessened without diminishing the picture. But any error arising from the inaccurate drawing or measurement of the plan will neither be increased nor diminished by this method; it is always necessary, therefore, when it is adopted, that the plan be so large that its points lying between the diminished parallels may still be taken with sufficient accuracy for setting the instrument, which could not be done were they brought too close together, as would be the case on a small plan.

From the principles which have been explained, the projection of different buildings in the same view from their separate plans will readily appear to depend on the proper parallels or measuring lines being laid down upon them, according

cording to the distances between the buildings and their relative positions to each other, and to the picture.

To render this more obvious, and also the method of finding the parallels on the distant plans, let fig. 9 be a general plan containing the sites or plans of two buildings, A and B; let C D be the ground line, E F a perpendicular to it in its centre, 9, 11, 12, &c. parallels to the picture, and 1, 2, 3, parallels to the perpendicular or radical at tenths of the distance of the picture apart. Now, if parts of the paper, as *a b c d* and *e f g h*, were cut out, the parallels upon them being marked with their proper numbers would serve equally well to project from as when connected with the rest of the sheet. But, suppose that separate plans are given, and that the distances between the buildings and the inclinations of their sides to one another are ascertained, it will be easy to find the proper parallels to each.

As an example, let A correspond to the plan, fig. 3, which has already been projected, and B to another plan, A B C D, fig. 10; and let them be found by measurement 100 feet apart from the point O of fig. 3, to the point *a* of fig. 10.

The measuring lines or parallels having been already determined, upon one of the plans fig. 3, draw through its point O the line O P, in the direction of the line of measurement between the buildings. In the same manner upon fig. 10, draw the line *a b* through the point *a;* then by the scale of feet to fig. 3, take the distance on C between the parallels, both to the picture and to the radial. The distance *e d* between the paralliels to K L is 12 feet and about 9 inches, or 12·75 decimally; and P *c*, the distance between the parallels to M N, 30 feet—The whole distance, 100 feet, therefore, being divided by these numbers, will give the

numbers of parallels between the plans. Thus 100 divided by 12·75 gives 7·87, that is ·787 of the distance of the picture, and by 30 gives 3·33, that is ·333 of the distance of the picture. To the first of these results, ·787, add 1·175, the distance of the point O from the eye, and the sum 1·962 will be the distance of the point *a* of fig. 10. Next from M N to O, fig. 3, there are ·084 of the distance of the picture; but since the line of measurement approaches to or cuts M N, subtract ·084 from ·333, and the remainder ·249, will be the parts of the distance of the picture which the point *a* of fig. 10 is distant from the perpendicular on the opposite side of it, to O of the other plan. Having thus determined the place of *a*, in relation to the picture and its perpendicular, draw through it the lines *c d*, *e f*, at right angles to one another, and inclined to *a b*, as K L, M N, fig. 3, are inclined to O P, and they will consequently be parallel to the picture and to its radial: then their distances having been found, it is very easy to set off from them the parallels 19, 20, 21, and 1, 2, 3, at the regular intervals; which being done, the projection is to be proceeded with as before. If the plans are drawn of different sizes, or scales, as in this case, then the spaces between the parallels upon them must be in proportion to their respective scales.

When the line of measurement between the objects (proceeding in a direction from the known point to the unknown) approaches to or cuts the perpendicular, as in the above case, the smaller distance or number of parallels taken from the greater, will give the place of the unknown point; but if, proceeding in the same direction, the line of measurement recedes from the perpendicular, then the sum of the distances must be taken to determine the place; and it

is

is evident, that if the number of parallels lying between the points of measurement be less than the number between any one of them and the perpendicular, they must both fall on the same side of it.

As the usefulness of such an instrument must depend upon its accuracy, and not less perhaps upon the readiness with which it can be set to the parts of its different scales, fig. 11. will shew in what manner it might be made, so as to have great advantages over one of the above form, both in respect of accuracy and easiness of being read; at the same time that it will be free from some smaller defects, which are however of considerable importance in working it.

Instead of making the same divisions serve for the different numbers of the three lines on each of the scales, which has been found to cause uncertainty and loss of time in counting the parts, there is on each of the scales, a distinct set of divisions corresponding to each line of numbers; and the tenths of these divisions are likewise obtained on the dividend and quotient scales by verniers, corresponding to each set of divisions. Hence, when the line on which the number is to be taken is determined, the parts can be read with the greatest certainty. For the purpose of preventing any doubt as to the corresponding lines to be taken in the operations, they are numbered 1, 2, 3 and 4, on each of the three scales, and at the beginning of each of the lines so numbered on the divisor scale is a table, shewing the dividend and quotient lines corresponding thereto, or which may be used when that divisor line is used. Thus when the divisor line, No. 1, is employed, the figures under D in the table divide the lines on which the dividend may be taken, and opposite to these figures under Q,

are

are others, denoting the line of the quotient scale, whereon the quotient will be found.

The instrument is represented set, and the following table contains all the divisors, dividends, and quotients, agreeably to its supposed adjustment.

| *Divisors.* | | *Dividends.* | | *Quotients.* | |
|---|---|---|---|---|---|
| *L | | L | | L | |
| 1 | 411 | 1 | 2414 | 3 | 5·87 |
| | —— | 2 | 482 | 4 | 1·174 |
| 2 | 822 | 1 | 2414 | 2 | 2·93 |
| | —— | 2 | 482 | 3 | ·587 |
| | —— | 3 | 965 | 4 | 1·174 |
| 3 | 1644 | 1 | 2414 | 1 | 1468 |
| | | 2 | 482 | 2 | 293 |
| | | 3 | 965 | 3 | 587 |
| | | 4 | 1931 | 4 | 1174 |
| 4 | 3288 | 2 | 482 | 1 | 1468 |
| | | 3 | 965 | 2 | 293 |
| | | 4 | 1931 | 3 | 587 |

Upon the first divisor line the edge *g g* cuts the number 4·11. Under the letter D, at the beginning of the line we find 1, which shews that a dividend may be taken on the first line. The number 24·1 is accordingly passed on that line by the edge *a b* of the slider, while the vernier of the line is also made to stand at 4, which, with the

* The figures under the letter L denote the lines of the scales on which the numbers are found. The decimal points are to be supplied according to circumstances, and are therefore left out in the Table; but in drawing them no alteration to them is required, though it was necessary in explaining the principles.

former

former three figures, makes 24·14. The quotient is then found on the third line of the quotient scale, as the figure 3 under 2 on the divisor line, indicates, and is 5·87 and a little more, the edge *a b* having passed 5·8 on the third line of the scale, while the vernier stands at 7. In the same manner the other numbers in the table may be found.

The secondary divisions on the first and fourth lines, which have been passed by the edges *a b* of the sliders, will be best counted opposite to the lower extremities of the vernier, which are placed so much lower for this purpose; but the divisions on the second and third lines being larger and less hid by the connecting bars of the sliders, the edges themselves are made use of. As the edges *a b* of the sliders cannot be brought to the ends of the scales, the edges *d f* can be taken by using the lower pins *e*, instead of the upper ones *c*, should it be necessary. These pins, and also the centre pin of the lines, are all of the same thickness. The edges of the limbs are tangents to the circumference of their centre pin, and the stoppers are opposite to the centre of the pins and to the quotient slider. The quotient and dividend scales consist of thin plates of brass, C D and E F, with two narrow thin slips rivetted along each, so as to leave a dove-tailed groove between them for the sliders. The edges of these grooves must be straight and parallel to each other, and likewise to the straight or ruling edges of the quotient scale. Upon these narrow slips of brass the scales are to be engraved, or upon thin slips of ivory planted over them.

The sliders are made of steel, covered with ivory for the vernier divisions; and the parts in the grooves are connected by narrow steel bars *a b* and *d f* with the outside pieces. The plate C D of the quotient scale is firmly

connected

connected with the stock A A B B by screws, and also with the brace K at the top, and can thereby be adjusted or made square, the screw pin at D serving as a kind of pivot or center. For greater security the plate is brought across the stock and firmly screwed to it by pins, which are hid under the plate B B. In the dove-tailed and parallel grooves G are steel sliders of the same length as the brass plate or cover H. To these sliders are screwed the plate E F of the dividend scale, and the opposite side L of the frame, with the cross or square head of which the plate E F is also connected.

The screws under the cover H which connect the plate E F to the steel bars, have broad thin heads, and the holes through which they pass in the plate are lengthened cross-ways to it, while the screw pin connecting the upper end of it with the square top L acts as a centre, by which means the dividend scale can be made parallel to the quotient scale. To the outer side of the stock, as will be seen by its section, fig. 12, is screwed a shoulder *m*, which may occasionally be taken off, and the lower edge of the stock made to move along the straight edge of a piece of wood fixed upon the drawing board, by which the horizontal line may be made farther from the bottom if necessary. The outside edge of the plate E F, as will be seen by its section fig. 13, is turned down, to produce greater stiffness; but the other edge is not, as it may occasionally have to be brought over a part of the quotient scale. At intervals of a few inches there are thin bits of ivory *n* pinned to the under side of the quotient scale, to keep the brass from soiling the paper, as shewn in figs. 12 and 13. This may be done likewise under the brace K.

In making use of this instrument there will seldom be occasion

# Mr. W. Warcup's Curvagraph.

Fig. 1.

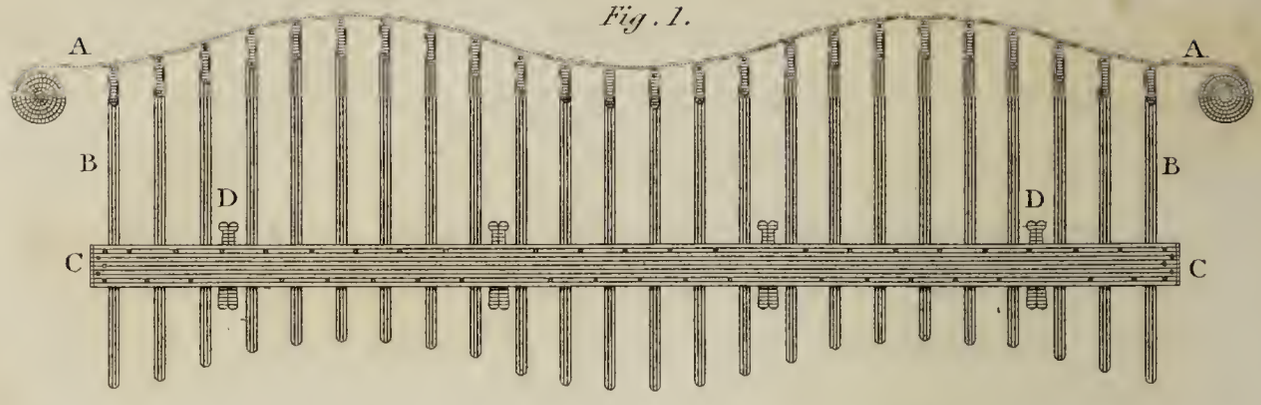



Fig. 3.

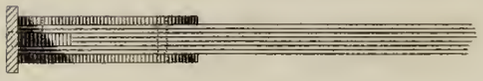


Fig. 4.

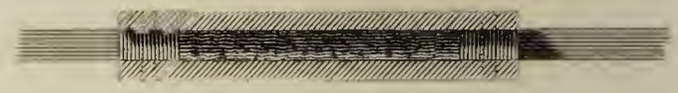


Fig. 2.

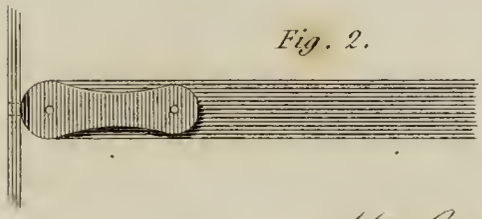
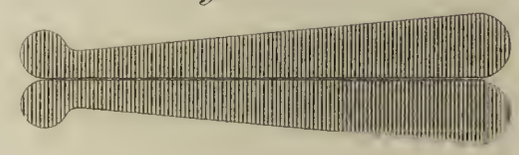
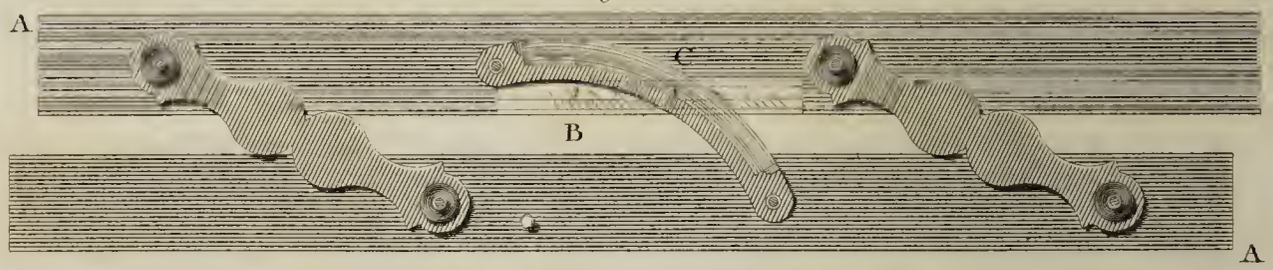


Fig. 5.



# Mr. G. Wood's Parallel Rule.

Fig. 6.




# Mr. Hall's Angulometer.

Fig. 7.

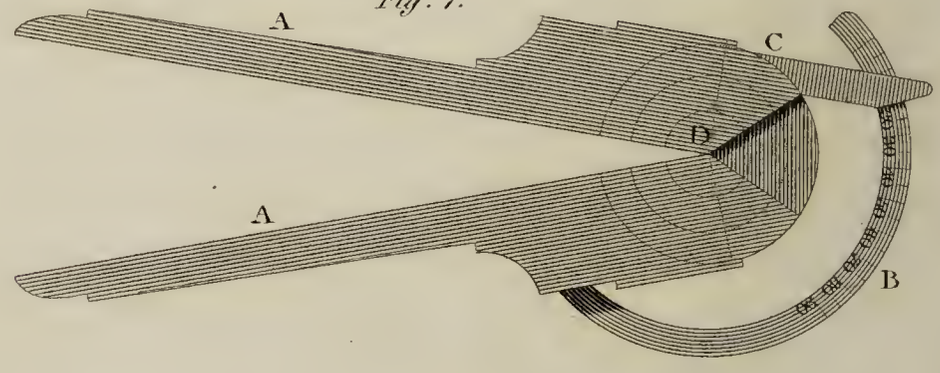



Fig. 8.

Fig. 9.

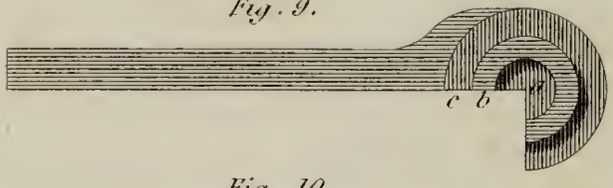



Fig. 10.

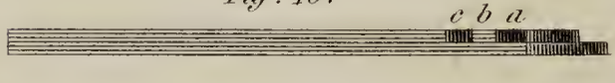



Fig. 11.

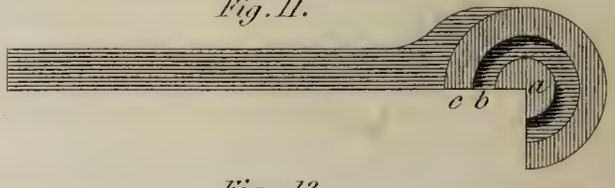
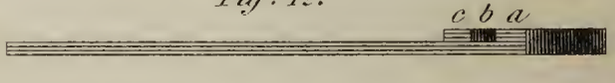



Fig. 12.



occasion to work by any other divisor line than the third, which comprehends a distance very nearly equal to twice that of the picture, and consequently more than will generally be required for any single plan; care being taken in laying down the parallels, to put that which is next to the picture and is numbered 1·1, either upon the farthest or nearest point of sight. There may likewise be some advantage in using the third divisor line, as the dividends and quotients are on the corresponding lines of their respective scales.

Any of the other sets of numbers may be used, but these will be found most useful in the projection of streets, or of a number of buildings in the same view, at great distances from one another.

D. DICK.

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*The* SILVER MEDAL *and* TEN GUINEAS *were this Session voted to Mr.* W. WARCUP, *of Dartford, Kent, for a Curvagraph. The following Communications were received from him on the subject, and one of the Instruments is preserved in the Society's Repository.*

SIR,

I BEG leave to lay before the Society of Arts, &c. an instrument of my invention for describing *curve lines*, which I purpose calling the *Curvagraph.*

It is not in my power to mention the various purposes to which this instrument may be applied, as I have hitherto used it only in mechanical and ship drawing, the several curves

curves of which may be drawn and constructed much more easily and expeditiously by means of this, than by any other method at present in use.

To naval draftsmen, I presume, it will be a valuable acquisition, as it will supersede the tedious operations they have recourse to, when they have no mould that will answer their intended curve, and it will enable them to copy drawings with the greatest accuracy and ease.

As the instrument is before the Society, I need not enlarge upon the principles on which it is constructed, or the mode of using it, as I trust it will be clearly understood by inspection.

Should the Society favour it with their patronage, any reward they may think proper to honor me with, will be gratefully acknowledged by their

Most obedient humble Servant,

W. WARCUP.

*High-street, Dartford, Kent,*
*February* 17, 1817.

To A. AIKIN, Esq. Sec.

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CERTIFICATES.

I DO certify that the Curvagraph, invented by Mr. Warcup, has proved to be a very useful and valuable instrument in delineating geometrical drawings of machinery, and that by the aid of that instrument much time has been saved in the course of Mr. Warcup's employment upon a long series of drawings made by that gentleman under my direction.

M. I. BRUNEL,

*Chelsea, February* 15, 1817.

GENTLEMEN,

GENTLEMEN,

UNDERSTANDING that Mr. Warcup has submitted to you his ingenious instrument and invention, the *Curvagraph*, allow me to say that I consider it an original invention, and one of considerable utility in engineering; but especially so in naval architecture, as it will not only much facilitate the forming of naval drawings, but avoid, in a great degree, the necessity of the present practice of using moulds, and the cause of great delay and expense.

I have the honour to be,
Gentlemen,
Your most obedient Servant,

GEORGE DODD.

*No. 8, Oxford-street, March* 12, 1817.

*To the Committee of Mechanics, &c. Society of Arts, &c.*

---

I DO hereby certify, that, having examined the *Curvagraph* invented by Mr. WARCUP, I am fully convinced that it is admirably adapted to promote dispatch when making copies of drawings, and evinces much ingenuity in its construction.

W. STONE.

*Deptford Yard, February* 25, 1817.

*To the Society of Arts, &c.*

---

I HEREBY certify, that the Curvagraph invented by Mr. WARCUP has been used under my observation, with very great advantage in ship drawing, and I have no doubt but in drawing curve lines generally, much valuable time may be saved

saved by the use of this instrument, and it is far preferable, in my opinion, to any thing that has hitherto been offered for such a purpose. I beg to recommend it as possessing a considerable degree af merit and ingenuity.

HENRY MAUDSLAY.

*Lambeth, March 5th*, 1817.

*To the Society of Arts, &c.*

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*Reference to the Engraving of Mr.* WARCUP'S *Curvagraph, Plate* 4.

FIG. 1, A A a plain slip of whalebone forming the ruler.

B B graduated ribs at right angles to the ruler, with which they are connected by small joints of brass, fig. 2, 3.

C C a beam, consisting of a case of whalebone containing slips of cork or of any other elastic material, and perforated to allow the ribs to pass through. Fig. 4, a section of the same.

D D bolts, consisting of two pieces of wood or of ivory, by the pressure of which against the elastic slips of cork the ribs are either kept in their place or released at pleasure. Fig. 5, the bolts on a larger scale.

*The*

*The* SILVER MEDAL *and* TEN GUINEAS *were this Session voted to Mr.* GEORGE WOOD, *of Chapel-street, Curtain-road, for a Parallel Rule. The following Communication was received from him on the subject, and one of the Rules is preserved in the Society's Repository.*

SIR,

I BEG leave to lay before the Society of Arts, &c. an improvement which I have made on the parallel rule, an instrument much used, especially by architectural and naval draftsmen. My improvement consists in adding a graduated scale of ivory and a brass arc, by means of which the artist is enabled at one operation to set his parallel lines at certain and precise distances from each other, instead of trusting, as is too often the case, to the accuracy of his eye rather than take the trouble of drawing a perpendicular, and dividing it by a scale of parts. The brass arc has the farther advantage of strengthening the instrument, which is a matter of some importance, particularly in rules of unusual length.

I remain, Sir,

Your obedient humble Servant,

GEORGE WOOD.

*No. 22, Chapel-street, Curtain-road, Nov. 4th,* 1816.

To. C. TAYLOR, M. D. SEC.

*Description of the Instrument, Plate 4, Fig. 6.*

A A, the rule.

B, a scale of ivory divided into inches and one-twelfth parts.

C, an arc of brass, the incidence of the outer edge of which on any of the divisions of the ivory scale determines the distance between any two parallel lines.

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*The* SILVER MEDAL *and* TEN GUINEAS *were this Session voted to Mr.* WILLIAM HALL, *of Lambeth, for an Angulometer. The following Communication was received from him on the subject, and one of the Instruments is preserved in the Society's Repository.*

SIR,

I BEG leave to send to you for the approbation of the Society of Arts the model of an angulometer of my invention. The peculiar advantage of this instrument is, that it opens from one to ninety degrees without any part of the joint coming into the internal angle. Hence, when any angle, solid or otherwise, has been measured by this instrument, it may immediately be transferred to paper without any farther operation, merely by drawing a pencil along the internal edge of the legs.

I am, Sir,

Your humble Servant,

WILLIAM HALL.

*No. 9, Belvidere-place, Narrow Wall, Lambeth,*
*February 28th,* 1817.

To C. TAYLOR, M. D. Sec.

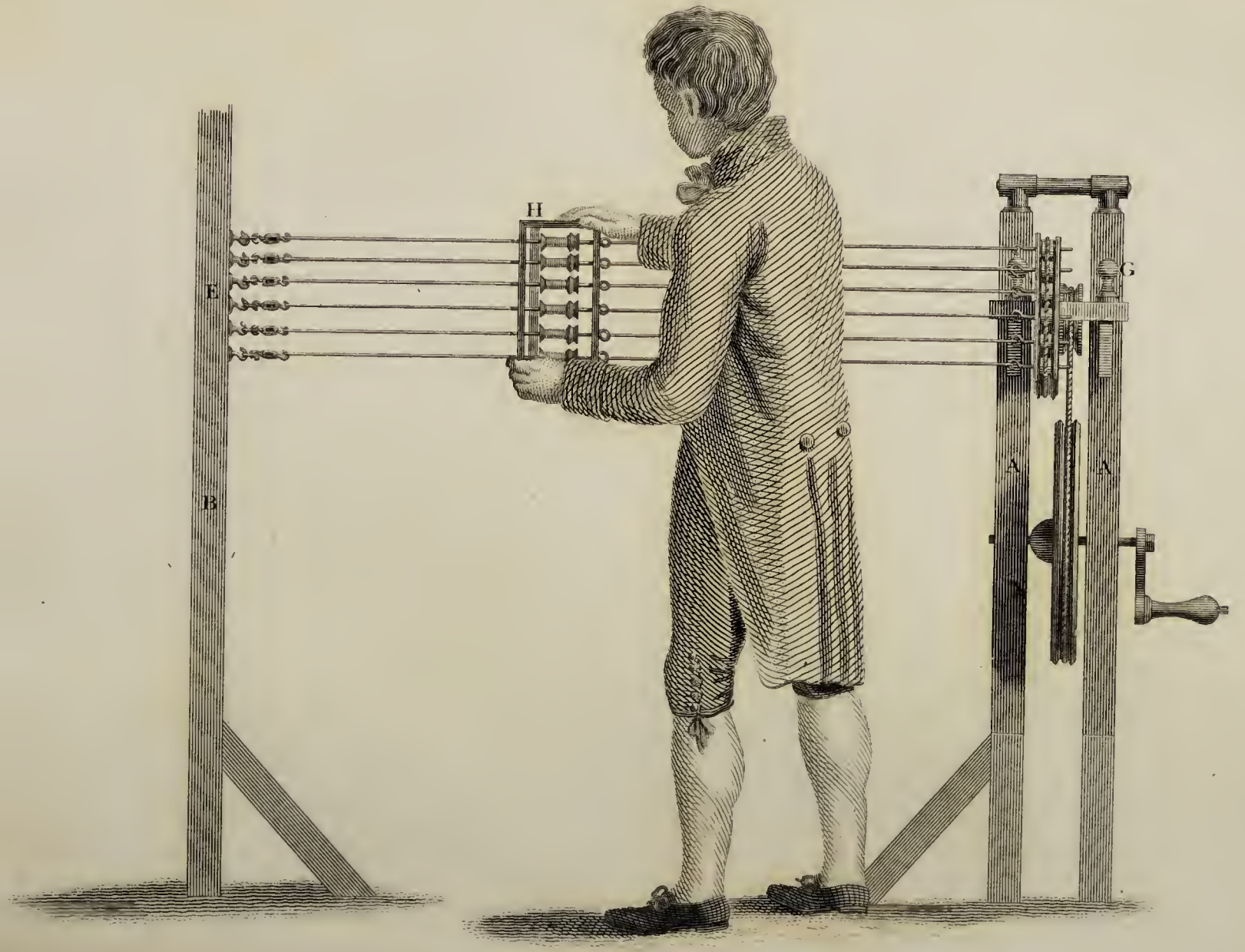
*Description*

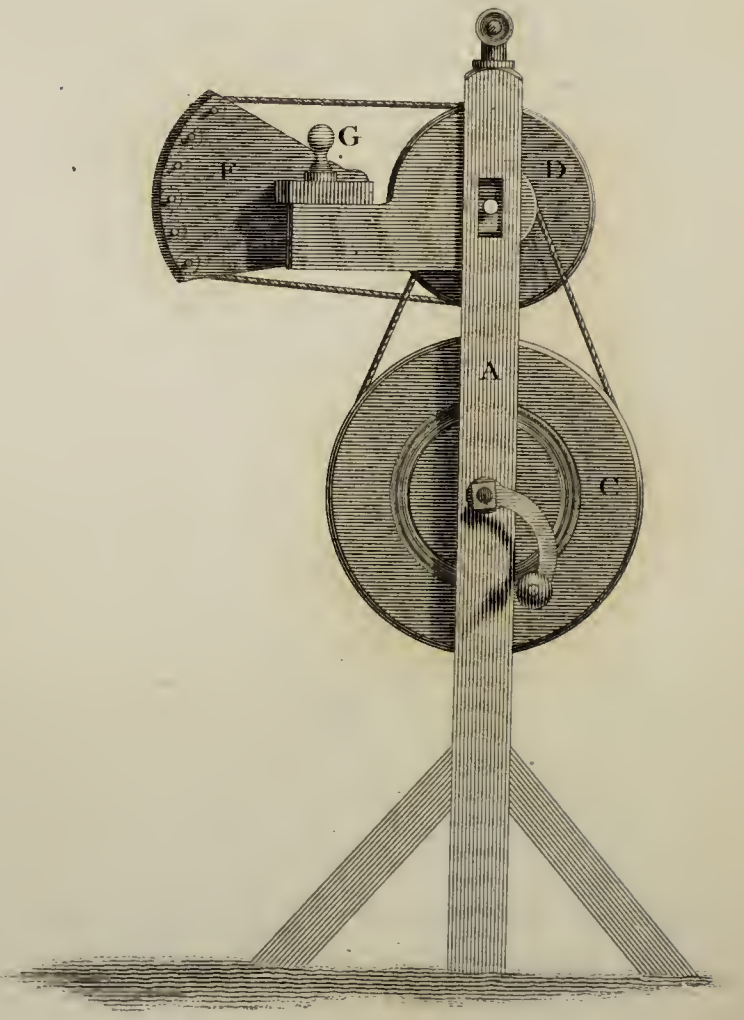
*Description of the Instrument, Plate 4.*

Fig. 7, A A, the legs.
B, a graduated arc.
C, the index.
D, the point of the angle.
Fig. 8, section of the above.
Figs. 9, 10, 11, 12, show the construction of the joint.
*a*, *b*, *c*, Wards working one on the other, and forming the joint.

# Mr. Taddington's Machine for covering Wire.

Pl. 6.




Drawn by W. Newton.

Engraved by James Davis.

# (Mr Saddington's Machine for covering Wire.)

Pl. 5.

Fig. 7.

Fig. 2.

Fig. 1.

Fig. 5.

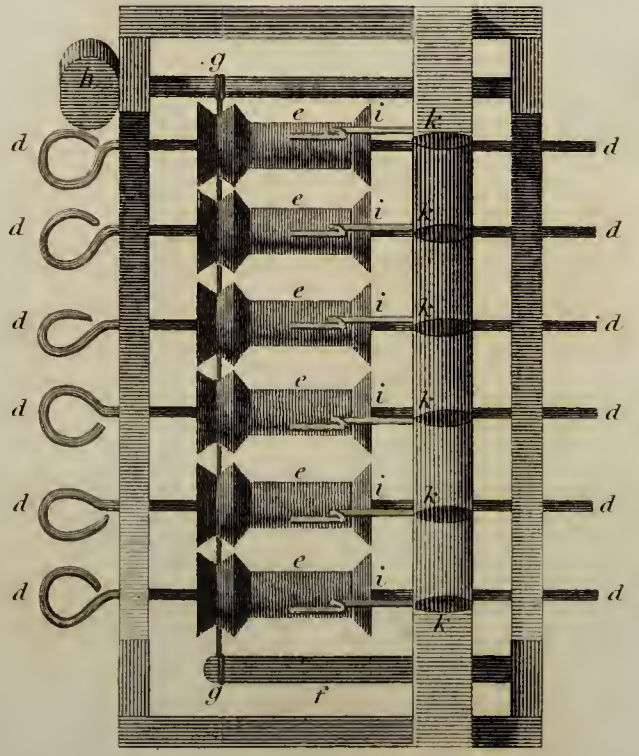



Fig. 6.

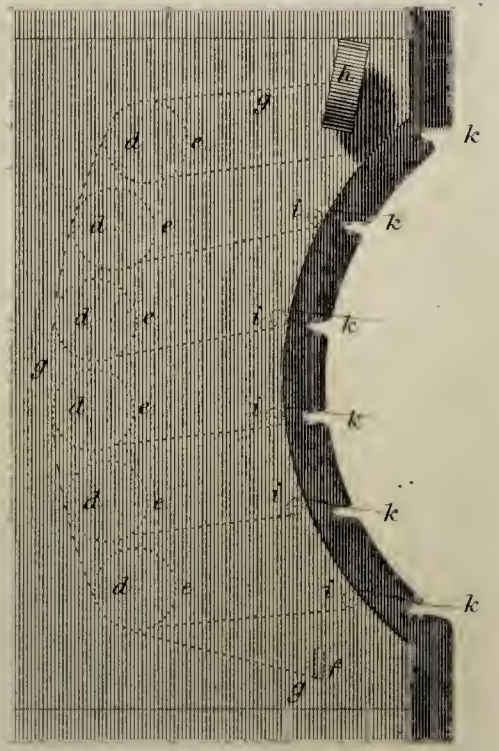
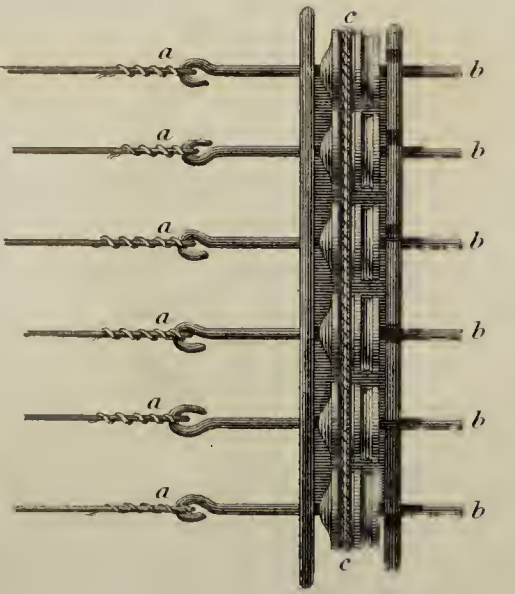



Fig. 4.

Fig. 3.




Drawn by W. Newton.

Engraved by James Davis.

# PAPERS

IN

# MANUFACTURES.

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FIFTEEN GUINEAS *were this Session voted to Mr.* T. SADDINGTON, *of Shadwell, for a Machine for covering Wire. The following Communication was received from him on the subject, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

WITH this communication you will receive a working model of an apparatus on an entirely new invented principle, which I have constructed and brought forward with a view to facilitate the manufacture of covered wire, and I shall esteem it a favour if you will lay the following particulars, together with the model, before the Society of Arts, &c. for their approbation.

About eight years ago, I had the honour of receiving a Premium of Thirty Guineas from the Society for the invention of a machine for covering wire in a small space of room,

the particulars of which are contained in the Twenty-seventh Volume of the Society's Transactions.

The present invention is an improvement on the mode of covering wire in long shops or sheds, as practised by all manufacturers who have the conveniency of such premises. The long shop covering or spinning, as it is generally termed, is by doing one length of wire at a time, yet it is the most expeditious manner of covering of any in practice, and notwithstanding the velocity with which the wire is turned round, the process of covering is very tedious, the revolutions of silk or cotton round the wire being from forty to one hundred and twenty in every inch, according to the fineness and purposes for which it is wanted. But, perhaps, the average may be fairly taken on the sizes of what is mostly used, at sixty revolutions for every inch of wire, so that each separate length of wire would have to perform 43,200 revolutions in a shed of only twenty yards long, and supposing the wire to be impelled round with a velocity to make fifty revolutions in every second of time, it would require more than fourteen minutes to cover a space of twenty yards in length.

By the present invention, six wires are all covered at one time, by which improvement, a saving is gained of five-sixths of the time occupied in the act of covering, or what may be expressed more plainly, fifty minutes are gained out of every hour so employed.

The upright posts, A, plate 5, of the machine, with the multiplying wheel, are fixed to the floor at one end of the shop, and B, at the extremity of the other end. To A, is attached an arm and fan, F, containing six grooved hooks placed in the form of a segment of a circle, which are carried round by the multiplying wheel, D; the band is adjusted

justed by the screw, G, which secures the fan to the arm. The axle of the wheel D, is supported on false beds, which may be raised by small wedges to tighten the band, as occasion requires. The six brass swivels at E, are fixed to the post, B, or to a board on the wall at the opposite end of the shop, and are placed in the same form as the hooks. The small portable box, H, contains the bobbins of silk for covering the wire, which are also placed in the same form as the hooks; they have a groove in each, in order to keep them steady and of a proper tension by means of a string of catgut passed over them, and wound round a pèg; in front of the box are notches for the wires to work in, and to keep them steady while covering.

As I am not myself in any respect engaged or interested in the article of covered wire, I have shown my new plan to the following persons, who are most respectable manufacturers, consequently competent judges of the merits of my invention, and who have favoured me with their testimonies of approbation, which you will herewith receive enclosed.

I remain, Sir,

Respectfully your's,

THOMAS SADDINGTON.

*No. 24, Shakespeare Walk, Shadwell,*
*March 26th,* 1817.

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CERTIFICATES.

SIR,

I HAVE attentively observed the method of covering wire by Mr. SADDINGTON's new invention, and take the liberty

of stating, that it is quite new to me, as the usual method is only to cover one wire at a time, and that by the hand, which is not likely to be so regular. I have been in the trade more than twenty years, and have never till this seen a similar method, or any thing approaching to it.

I remain, Sir,
Your obedient Servant,
W. FARMER.

*44, Bread-Street, March,* 1817.

To A. AIKIN, Esq. SEC.

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SIR,

I HAVE particularly inspected Mr. SADDINGTON's new invented machine for covering wire, and I hereby testify my approbation of it, considering it an original in covering six wires at a time, the usual mode being by covering them singly

I remain, Sir,
Your humble Servant,
H. R. FANSHAWE.

*Addle-Street, Aldermanbury, March 8th,* 1817.

To. A. AIKIN, Esq. SEC.

---

SIR,

HAVING inspected Mr. SADDINGTON's improved plan of covering wire on the principle of what is generally termed long shop spinning, I hereby testify my approbation of it, as it is the first of the kind that I have either seen or heard of.

of. The common mode of covering wire is by doing only one length of it of going down the shop each time, consequently a great deal of time is saved by his contrivance of confining the bobbins of silk in a box so as to cover several lengths of wire in the same space of time as is required to cover one in the usual way.

I remain, Sir,
Your obedient Servant,
W. WITHALL.

*No. 5, Featherstone-street, Finsbury-Square.*

To A. AIKIN, Esq. SEC.

---

SIR,

I HAVE seen Mr. SADDINGTON's new invented machine for covering wire, and I hereby approve of his plan, as it will cover several wires at once, instead of the common way of doing one at a time, which certainly is a great saving.

I remain,
Your obedient Servant,
RICHARD DAVIES.

*No. 8, George-street, Fetter-Lane.*

To A. AIKIN, Esq. SEC.

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*Reference to the Engraving of Mr.* SADDINGTON's *Machine for covering Wire, Plates 5 and 6.*

Plate 6. fig. 1, a view of the swivels (E, pl. 5.)
Fig. 2, a section of the same.

Figs. 3

Figs. 3 and 4, a side and front view of the fan (F, pl. 5.)

*a b*, the hooks.

*c c*, the small wheels, with the band passing over them, by which the hooks are made to revolve.

5 and 6, a front and side view of the box, (H, pl. 5.)

*d d*, the spindles.

*e e*, the bobbins containing the silk.

*f*, the spring of whalebone; *g g*, the band of catgut; and *h*, the peg, by means of which an equal degree of tension is given to the bobbins.

*i i*, loops of wire (shewn more clearly by fig. 7,) through which the silk from the bobbins passes, and by means of which, and the notches, *k k*, the threads are kept in their proper places.

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*The* SILVER ISIS MEDAL, *or* FIVE GUINEAS, *were this Session voted to Mr.* R. ONWIN, *of Oxford-street, for a Banding Plane. The following Communication was received from him, and a Model of the Invention is preserved in the Society's Repository.*

SIR,

I BEG leave to submit to the examination of the Society for the Encouragement of Arts, &c. my new-invented banding plane for cutting ornamental lines of brass and ebony, and also grooves to receive them in cabinet furniture: It does this at one operation infinitely cleaner and more accurately than by the methods at present in use, which, requiring

two

# Mr Owen's Banding Plane.



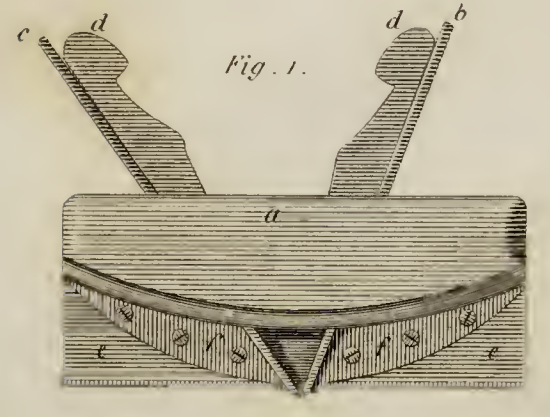


Fig. 1.

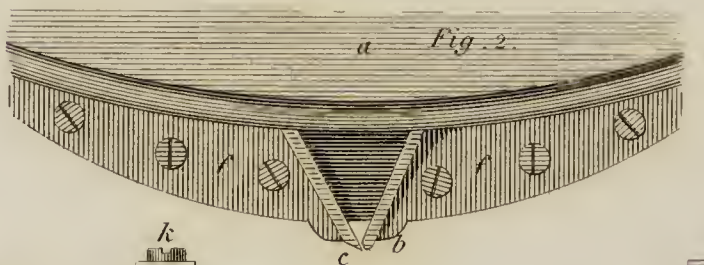


Fig. 2.

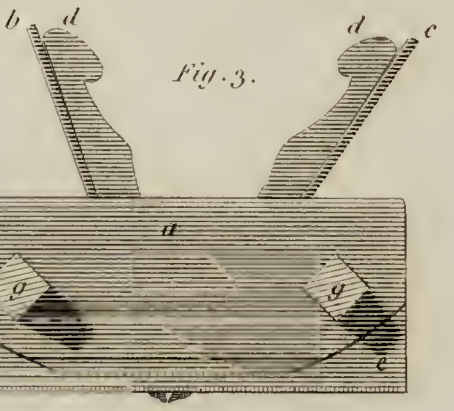


Fig. 3.

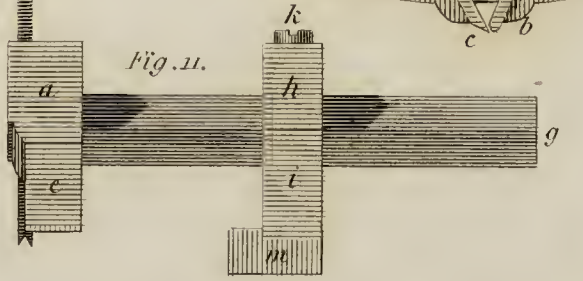


Fig. 11.

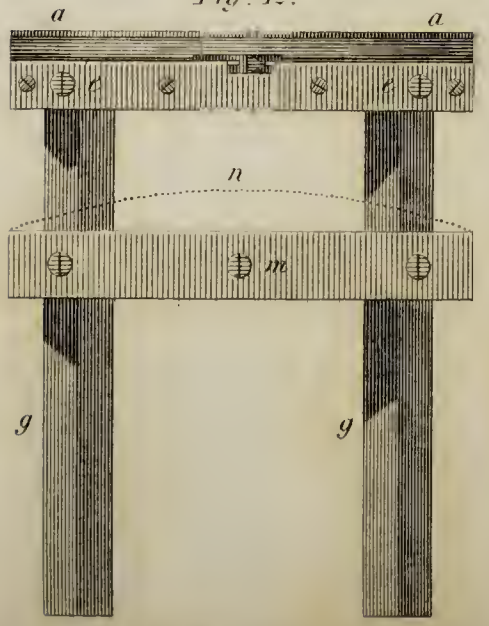


Fig. 12.

Fig. 13.


Fig. 14.

Fig. 5.

Fig. 6.

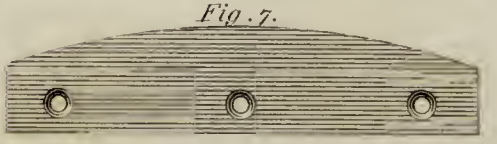


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 15.

Fig. 16.

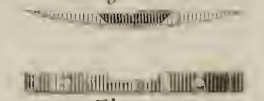


Fig. 18.

Fig. 17.

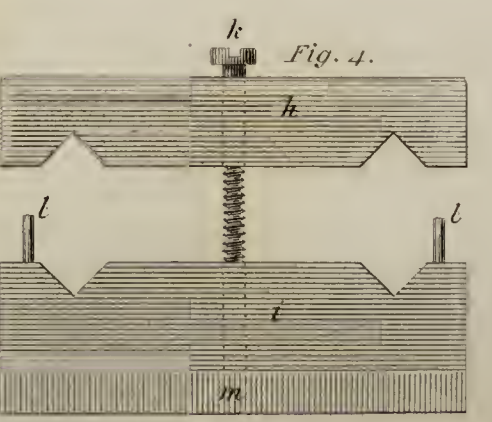
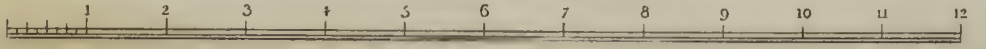


Fig. 4.

Scale of Inches




Drawn by W. Newton.

Engraved by C. Gladwin.

two operations, take the workman as long to groove a foot as ten feet may be done, better by my plane.

A great disadvantage of the present method is, that in the cutting gauge the cutters, being necessarily thicker in the middle and upper parts, bruise and widen the upper edges of the groove, so that the glue shews in such places, and the workman is frequently at great trouble in concealing such defects. But with my plane, as fast as the cutters pierce the wood, the router follows close after, and clears the wood out of the groove; the outer sides of the cutters being parallel, the edge of the grooves remain unbruised, and exactly at equal distances, and the same tool cutting the line, it must always fit close at the sides.

In the old way of routing the wood the grooves are torn and uneven at the bottom, through which irregularities as the glue dries the line is drawn down in places. By my plane the bottoms of the grooves are smooth, even, and of a regular depth; of course the glue holding the line in all parts alike, it ties more secure from starting out than hitherto.

By the movable fences making four changes, it works curves of every kind with an ease and steadiness which has obtained it the approbation of all cabinet-makers who have tried or seen it, and by whom I have been encouraged to submit it to the Society.

I am, Sir,
Your most humble Servant,
RICHARD ONWIN.

*Oxford-street, April,* 1817.

To A. Aikin, Esq. Sec.

*Reference*

*Reference to the Engraving of Mr.* ONWIN'S *Banding Plane, Plate 7.*

Fig. 1, *a*, the wooden frame through which the cutter *b*, and the chizel called the router, *c*, pass.

*d d*, wedges of wood by which the cutter and router are fixed at any given degree of projection beyond the flat piece, *e e*, according to the depth of the groove intended to be cut.

*f f*, cheeks of steel firmly screwed to the frame, in order to support the pressure, and to steady the motion of the instrument.

Fig. 2, shews, on a large scale, the steel cheeks, *f f*, the cutter *b*, and the router, *c*; the flat piece, *e e*, being removed.

Fig. 3, shews the opposite side of the instrument, from which project two legs, *g g*, on which the director traverses.

Fig. 4, the director, consisting of three pieces of wood, two of which, *h*, *i*, are capable of being fastened together by the screw, *k*, and the two pegs, *l*, *l*, and hence will slide easily on the legs, or may be firmly fixed to them, at the pleasure of the workman. The fence, *m*, is fixed by screws to the piece *i*, and, according to the form given to its own edge, determines that of the groove made by the cutter.

Figs. 5, 6, 7, 8, 9, 10, front and side views of different varieties of the fence, *m*, according as the groove required to be cut is straight, or curved externally or internally.

Fig. 11, is a lateral view of the plane. The fence, *m*,

is of the same form as that represented at figs. 5 and 6, and is employed when a straight groove is required to be cut.

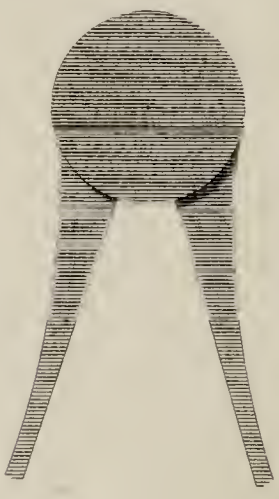
Fig. 12, is a view of the under side of the plane; the dotted line, *n*, represents the edge of the fence 7 and 8, which is employed when a groove externally covered is required to be cut.

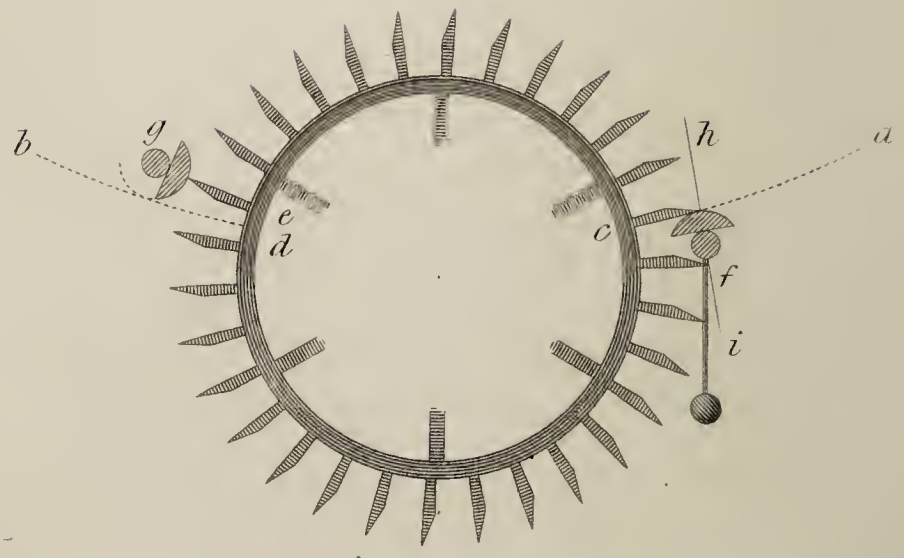
Figs. 13, 14, a front and side view of the cutter.

Figs. 15, 16, ditto of the chizel, called the router.

Figs. 17, 18, a view and section of a piece of steel to be screwed on instead of *c*, *c*.

# Mr. W. Wynn's Timekeeper.






Engraved by J.B. Taylor

# Mr W.m Wynns Time keeper & Compensation Pendulum.

Fig. 1.

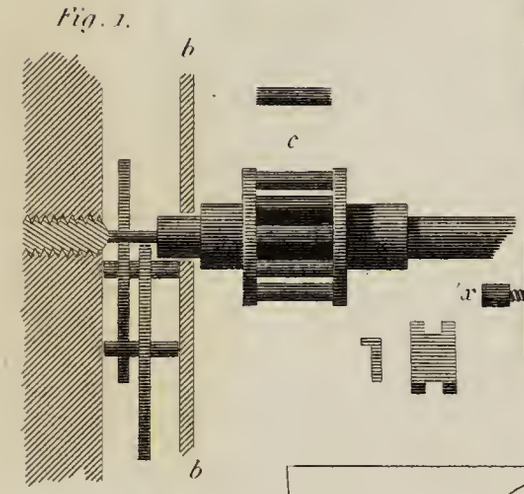



Fig. 5.

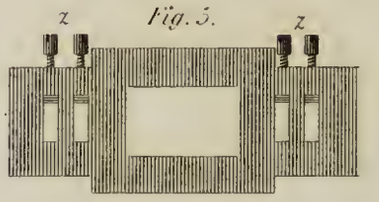
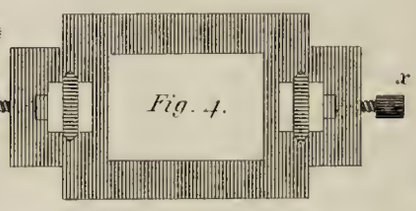



Fig. 4.



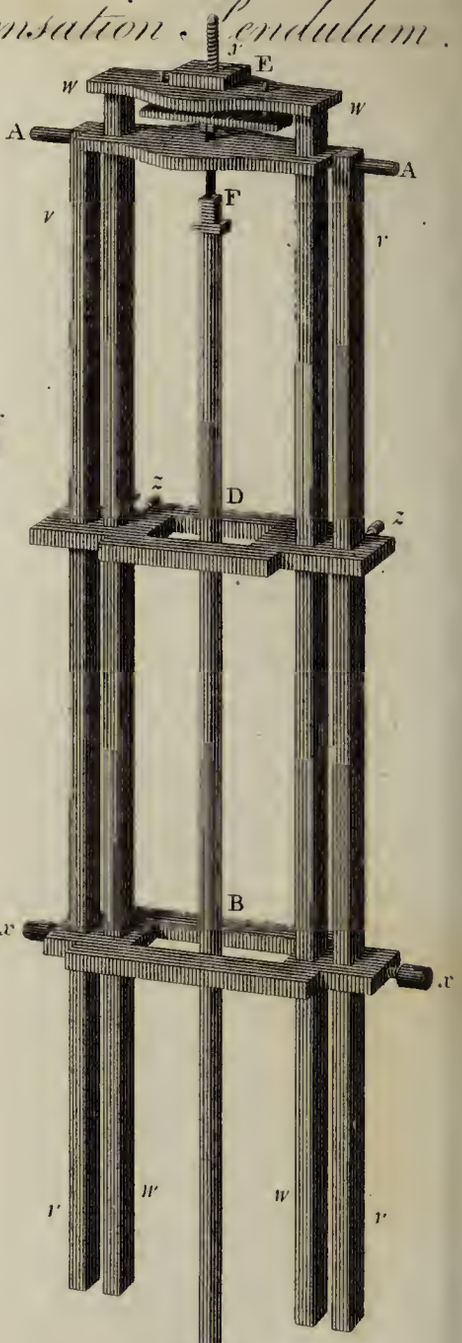
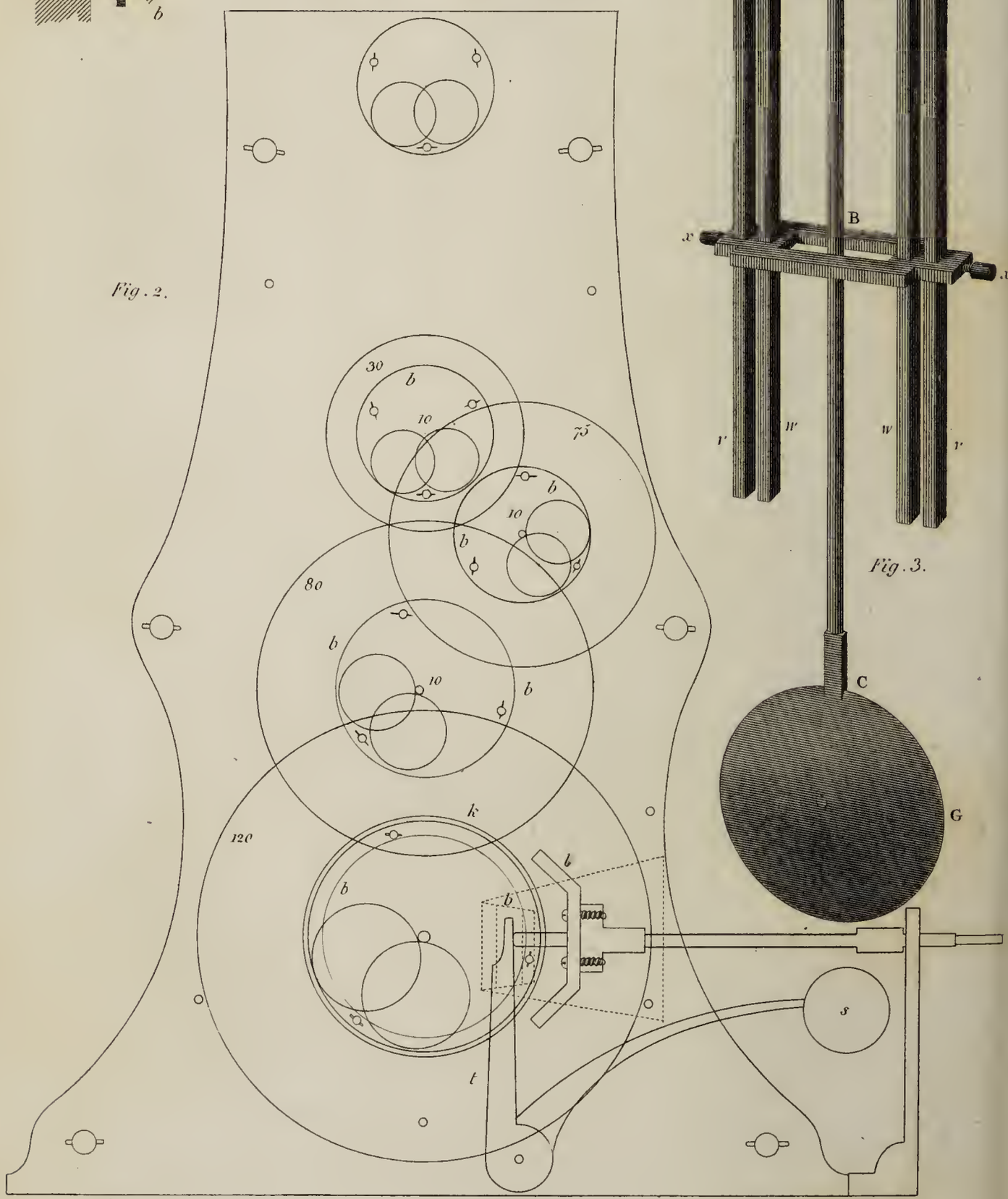




Fig. 3.

Fig. 2.

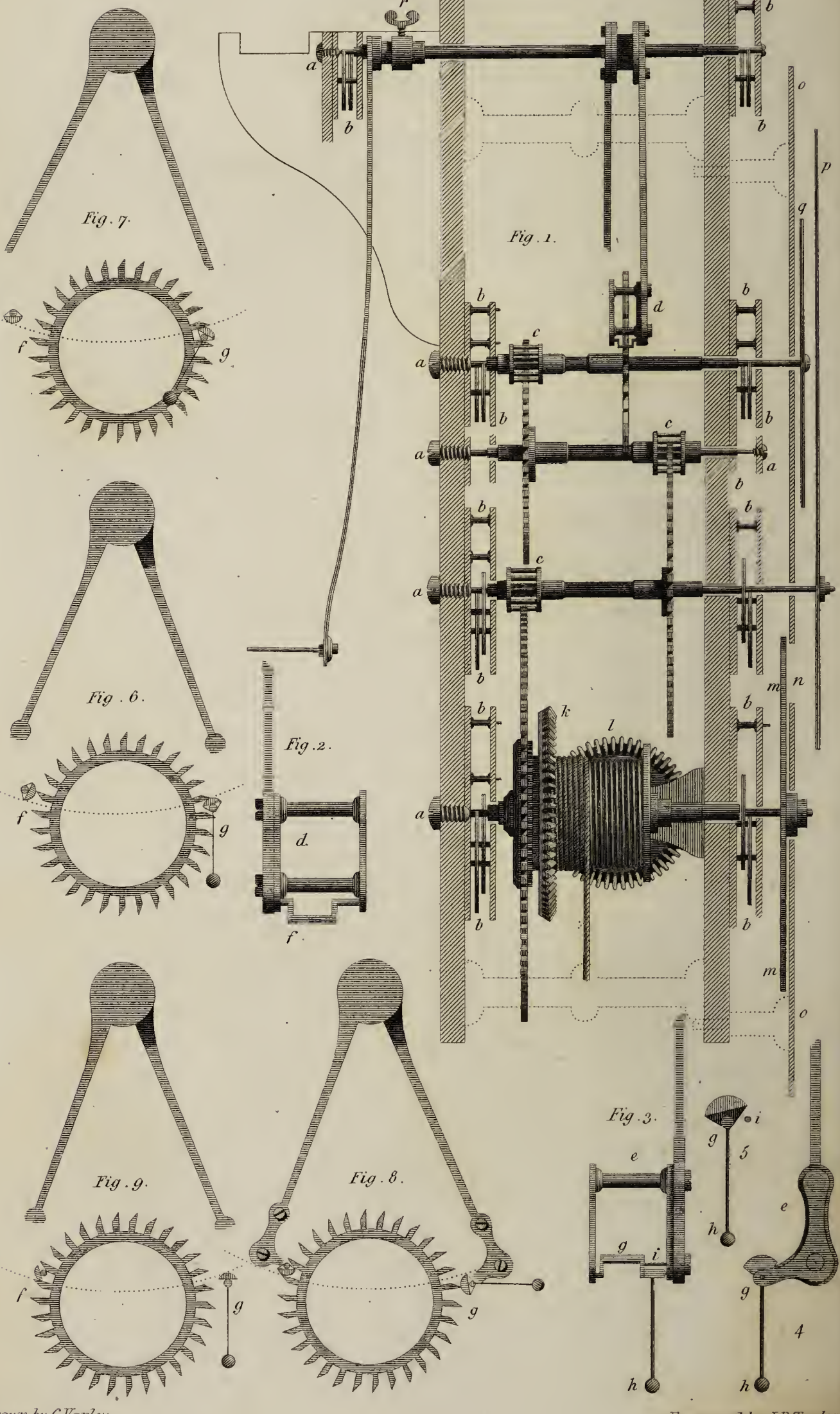



Drawn by C Varley

Engraved by J.B Taylor

# Mr. Wm. Wynns, Time-keeper.





# PAPERS

IN

# MECHANICS.

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*The* GOLD ISIS MEDAL, *and* TWENTY GUINEAS, *were this Session voted to Mr.* WILLIAM WYNN, *of Farnham, for a Time-keeper and Compensating Pendulum. The following Communications were received from him on the subject, and Models of the Inventions are preserved in the Society's Repository.*

SIR,

I BEG leave to lay before the Society for the Encouragement of Arts, Manufactures, and Commerce, a time-keeper, and a compensating pendulum, on a new construction. They are of my invention. I also forward the description.

I am, Sir,
Your most obedient Servant,
WILLIAM WYNN.

*Farnham, May 5,* 1817.

To A. AIKIN, Esq. Sec.

*Description*

*Description of and Observations on the Time-keeper.*

It has ever been my opinion, from the experience I have had, that friction is one of the greatest enemies that clock-makers have to contend with in the construction of a perfect time-keeper; because it is a resistance which continually increases as the movement becomes foul, and varies as the oil is more or less liquid by the change of temperature of the atmosphere. I have, therefore, for some years, been endeavouring to form a plan to reduce it, and I flatter myself I can demonstrate by the one I have the honour to exhibit a very material diminution of friction in every part where it is to be met with in time-keepers of a common construction, and in some of the parts have entirely done away with it.

I have made the pinions to consist of cylinders which run freely round on small pivots, of one-fifth of their diameters, between two brass collets. When the tooth of the wheel comes in contact with each of those cylinders, it will run round on its pivot instead of suffering the tooth of the wheel to rub round a part of its circumference, or, as in common pinions, round the pinion-leaf. This will cause a diminution of friction in proportion as the diameter of the cylinder is to its pivot, and four-fifths of the friction will be lost.

I have placed friction-wheels in contact with all the pivots in the frame, which will reduce the rubbing friction of them as the diameters of the rollers to the diameters of their pivots, which cannot be less than twenty-five or thirty to one. The application of friction-wheels to pivots in many machines is by no means new; but I think it is new as applied to clock-movements.

The

The pallets are constructed of two segments of cylinders, which come in contact with the teeth of the swing-wheel, and go round on very small pivots immediately as the teeth strike each of them; and therefore they suffer the pendulum to vibrate after it has received its impulse with the smallest possible and most equal resistance; as the proportion of friction with these pallets, compared with the common dead scapement, is as the diameters of the cylinders, provided they were whole, to the diameters of their pivots, which is not less than twenty to one. When the pallet returns to give the impulse for the next oscillation, it still acts upon the rolling cylinder, slides along the curved inclined plane, and causes an equality of impulse, which must contribute to preserve a more equal arc of vibration than any time-keeper I have seen or heard described.

Besides the advantages gained by these diminutions of friction, I shall be able to make the movement go without oiling any of those parts which are usually oiled; as it will be necessary to oil only the pivots of the friction-wheels and cylinders, and not any of those parts in contact which are usually oiled; for as all the parts in contact will have a rolling and not a rubbing friction, (I know no better way to express the difference), there will be no necessity to oil them.

The parts which will require oil will be so very remote, in point of influence, that its maintaining power, and the resistance of the friction of the scapement, will be always equal in all variations of temperature and foulness. The pendulum must therefore oscillate at all times in an equal arc of vibration, which will prevent the necessity of using any artificial means to preserve the isochronism of unequal arcs.

I intend entirely to dispense with the wheels called motion wheels, which give motion to the hands. As three of the wheels of the movement revolve in the times which are necessary to give motion to the hour, minute, and seconds hands, they may as well be fixed to their several axes, as to be under the necessity of loading the movement with three extra wheels and a pinion for that purpose. The wheels which are destined to carry the minute and seconds' hands, will naturally have their motion in a forward direction, as there is a wheel in the movement between the two; but the wheel for the hour hand, viz. the great wheel, has a retrograde motion, which difficulty is obviated by having the hour figures engraved on a small circular plate instead of the dial, and fixing this plate on the axis of the great wheel instead of a hand. A hole is cut through the dial plate to let the hour figures appear through, and an index fixed to the dial to point to the figures. By adopting this plan the hour figures will not be retrograde, and consequently there will be no difficulty for the most ignorant to understand the hour the same as on a common clock. The only objection which can be made to leaving out the motion wheels is, that when the piece is to be set, each of the three hands must be set to the hour, minute and second of time; but that is a trifling objection compared to the advantage gained by the annihilation of friction and resistance which will be found in dispensing with them.

As the hour circle is fixed to the axis of the great wheel, the weight cannot be wound in the usual way through the dial plate. I have therefore cut the barrel-cap as a wheel of the bevel gear, and placed another wheel of the same sort with its axis at right angles to the axis of the barrel, with its teeth to run in the barrel wheel; and by having its

axis

axis extended to the side of the case, wind it up on the right hand side of it. The wheel on which the winder will go on is run in a sort of frame, with a considerable end-shake, and a poised lever acts against the inner pivot to drive the teeth of the handle wheel from being in contact with the barrel cap wheel, and prevent it from loading the movement as it goes. When the person winds up the piece, he must force the handle wheel inwards, so as to take hold of the barrel cap wheel, and wind it up; and, as soon as he takes off the handle, the wheel will fall back out of the way, and will be unconnected with the movement.

As I consider the pulley to be the worst mechanical power which is applied to clock work, I have done without it entirely, and suspend the weight with a single cord. I have made the barrel of half the usual diameter, which gives the movement the same time to go without winding, as the usual size with a pulley. The barrel, consequently, is not above one-fourth or one-sixth the weight of common sized ones, which will be again an advantage in the construction of the piece; as I consider that all the parts which are in motion ought to be made as light as possible, so as to have sufficient strength for their purpose. And, as all those are required to be light, so the frame and all stationary parts are required to be very strong and firm, to prevent the weight and pendulum from making it bend or sink out of the perpendicular, as it is obvious that no movement can keep regular time if it is not very substantial.

Having projected the movement, I began to consider what sort of pendulum to make use of. I had objections to the gridiron one, because the compensating bars are such a load to the pendulum, and raise the centre of oscillation above the point which ought to be the true one, because they suffer so much resistance in passing through the air; which re-

sistance is continually subject to change, from the alterations of the density of the atmosphere, particularly in our climate, and because of the very great difficulty, if not impossibility, of adjusting the length of the compensating rods in proportion to the expansion of the metals made use of. I have been able to obviate all these difficulties, as I have contrived one which has nothing whatever in motion but the ball and one rod, and affords the means of altering the proportionate lengths of the compensating rods with the greatest minuteness at any time, without altering in the least the length of the centre of oscillation; and, with requisite attention, it can be adjusted with the greatest accuracy. The construction of it is as follows:—

A, plate 9, fig. 3, is a horizontal bar of brass, which is suspended on the movement: *v v*, are two steel rods, which are suspended on each end of A. B, is a horizontal bar of brass, with a square hole on the centre, sufficiently large to suffer the moveable rod, C, to swing freely between. On each side of the large square hole there is one smaller square one to fit one of the steel bars, *v v*, together with a zinc one, *w w*, of the same size, and a small piece of loose brass to keep the steel and zinc bars apart. On each side of the horizontal bar, B, is a screw, *x*, which screws against the side of the steel bar *v*, and fixes both the steel and zinc rods tightly in their holes. D, is another horizontal bar, which has also a square hole for the pendulum rod to swing in, and two holes on each side, which the two pairs of steel and zinc rods fit and pass freely through: *z z*, are two screws, which screw against the pair of steel rods to keep the bar, D, in its place, and also to keep both the pairs of rods always parallel. In the horizontal bar, A, is a square hole, at each end of which the pair of zinc rods pass freely through, and at about an inch

inch above the bar, A, is another horizontal bar, E, in which are firmly rivetted both ends of the zinc bars. In the centre of the bar, E, is a hole, through which passes a piece of steel which is square at the bottom, and has a screw about half an inch long cut in the top, on which goes a nut to support the moveable rod, C. The pendulum spring, F, is rivetted into the square part at the bottom of the steel piece already mentioned. In the centre of the bar, A, is a slit to suffer the pendulum spring, F, to pass freely through; at a small distance below the bar A, (about the length the pendulum spring is usually made,) the steel moveable rod, C, is to be rivetted to the spring, and the ball of lead G is suspended by its centre at the bottom of the rod C.

The compensating principle of this pendulum is the same as the gridiron one, with the advantage of having nothing but the centre rod C and ball G in motion, and it acts thus: Supposing the expansion of zinc to steel to be in whole numbers, as five to two; if a change of temperature should occur, which would increase the length, 26 inches, of the steel rods *v v* two parts, the moveable rod C of 39 inches would be increased three parts, making an increase downwards of five parts. Then the same variation of temperature, in consequence of the above proportionate expansion of zinc and steel, would increase the length of the zinc rods of 26 inches in an upward direction five parts, and draw the pendulum spring F through the slit in the bar A, and shorten the centre of motion of the moveable rod, just in the same proportion as the steel rods *v v* and the moveable rod C were increased in length, and thus preserve the length of the centre of oscillation.

As the experiment to ascertain the expansion of metals is so delicate, it is very difficult to find the true proportionate

lengths of the greater and less expanding rods, which are applied so as to preserve the length of the pendulum from change; and if the proper proportion is not found before the pendulum is made, it must be difficult and sometimes impossible to alter them. I have completely obviated this difficulty, and have the means of altering the proportion of the rods *v v* and *w w* in as minute or as great a degree as I please.

As I have before described, the zinc rods will always pass freely through the horizontal bar D, but if for instance I find by an increase of temperature that the pendulum should become shorter, or that the piece should gain, I shall then know that I have too great length of the upper expanding rod, namely zinc. I have therefore put two screws, which I shall screw in against the zinc rods, and as the two screws *z z* are always kept tight, the pendulum will then be held together by the centre bar D, and by that means the length of the rod C will be preserved. I shall then slacken the two screws *x x*, and raise the horizontal bar B upwards as much as I judge proper, tighten the screws *z z*, and slacken again the two that press against the zinc rods. When that is done, the proportionate length of the zinc is shortened, and consequently the upper expansion will not be so great.

To regulate the time-keeper, I alter the length of the moveable rod C by the nut which goes on the screw *y*, by which means I can at all times regulate it without stopping the pendulum, which is no small convenience; for, if you are under the necessity of stopping it, it is some time before it attains exactly the same arc of vibration as it naturally has, and consequently a trifling variation must take place in its rate before it does attain that.

I have

I have placed a small loose plug for each of the ends of the screws to come in contact with, in order to prevent them from bruising the rods.

Another advantage which attends the pendulum described, is, that all the rods and bars may be made of as strong a substance as the workman pleases, as he need not be fearful of loading the pendulum in consequence of the compensating rods being at rest.

The workman is not prevented by this contrivance from making the pendulum spring pass between cycloidal cheeks, as they may be applied, if he think proper, to the horizontal bar, A.

I have made the model and drawing of the pendulum which accompanies this on a scale of three inches to the foot, and have adopted the combination of steel and zinc; but a pendulum may be formed of any combination of metals which may be preferred.

I hope the improvements I have made in the useful piece of mechanism which I have now the honour to lay before the Society for the Encouragement of Arts, may be found worthy their notice, and that I have given such a description of it as to convey a just idea of its principles: Should it meet with their approbation, I will make such a model of it as shall exhibit all its principles. If any further description shall be necessary, I shall be happy to give it either personally or by writing or drawing, in the best manner I am capable of.

*Reference to the Engraving of Mr.* W. Wynn's *Time-Keeper, and Compensation Pendulum.*

Plate 8, fig. 1, a side elevation, the plates and friction-wheel frames being in section to show the pivots, which lie on friction rollers; the pivots are double, the larger one going through the same plate without touching it, and the smallest resting on the friction wheels: screws, *a a a a a a*, in the plates meet the pivot ends, and prevent their shoulders from touching the friction wheels or the frame plates, the shoulders are about $_2\frac{1}{0\,0}$ of an inch from the wheels: the friction wheel frames, *b b*, *b b*, *b b*, *b b*, *b b*, *b b*, *b b*, are moveable on their centres opposite the pivots, by which they may be adjusted to receive the pivots on the side of friction.

*c c c*, Lantern pinions, the cylinders of which turn on small pivots; one of these pinions and a cylinder detached is shown full size at *c*, fig. 1, on plate 9.

*d e*, The pallet-frames; the pallets are segments of cylinders, shown full size in figs. 2, 3, 4, and 5.

*f*, and *g*, A small weight *h* hangs to the pallet *g* to keep it up in the best position to receive the teeth of the swing wheel; a pin at *i*, stops the pallet from vibrating at the instant that the weight *h* falls.

Figs. 6 and 7, show the wheel escaping the pallet *f*, and acting on the pallet, *g*.

Figs. 8 and 9, shew the escape from the pallet, *g*, and the action on the pallet, *f*.

*k* and *l*, fig. 1, Two bevel wheels to wind up the clock: *m m* the hour circle on the great wheel axis; *n* the hole in the dial to show the hours; *o o* the dial-plate, *p* the minute-hand, *q* the seconds hand; the friction wheels of the third

wheel

wheel are left out to prevent confusion; *r* a screw to fix the crutch on the axis when the pendulum is adjusted.

Plate 9, fig. 2, the clock-plates, with the calipering of the train, showing the position of the friction-wheels in their frames *b b*; *k l* the bevel wind-up wheels; *s* a weight, which by the arm *t* disengages the teeth of the wheel *l* from the wheel *k* after it is wound up, its arbor sliding in the pivot holes; the dotted line represents the cock which supports the front pivot.

Fig. 3, a compensation pendulum frame, by which the compensation and adjustment is at top detached entirely from the pendulum; *v v*, *v v* two steel rods suspended at top; *w w*, *w w*, two rods of zinc, or of any metal that will expand more than twice as much as steel; if the metal expand less than twice, the rods must be so much longer than the pendulum; that is, the pendulum rod and rod *v v* together must be as much longer than the metal *w w* as its expansion is greater than steel; *x x* two screws in a moveable frame to fasten the steel and zinc rods together at any place the compensation may require; lowering this frame increases, and raising it decreases the compensating power; the rods being fastened together at bottom, whenever the steel expands, the surplus expansion of the metal *w w* must be upwards, and that elevates the screw *y* (to which the pendulum hangs) as much above the point of oscillation as the pendulum rod has lengthened, by which the ball is always kept at the same distance below the point of oscillation.

The nut on the screw *y* serves for regulating the clock: a piece of brass on the square bottom of the screw, with two steady pins, hold the screw from turning with the nut: *z z*, four screws in another frame; they are to give steadiness to

the

the rods by holding them together, but not tight enough to prevent their sliding by expansion.

Figs. 4 and 5, show the plates separately; the figure of the bit of brass which divides each pair in the bottom plate is shown detached.

The figures of the clock are half the real size, but figs. 2, 3, 4, and 5, plate 1, and fig. 1, plate 2, are full size.

Plate 10, shews the escapement (fig. 9, pl. 8) of the full size.

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*The* SILVER ISIS MEDAL *and* TWENTY GUINEAS *were this Session voted to Mr.* J. PRIOR, *of Nessfield, near Skipton, for the Striking part of a Clock. The following Communications were received from him, and a Model of the Invention is preserved in the Society's Repository.*

DEAR SIR,

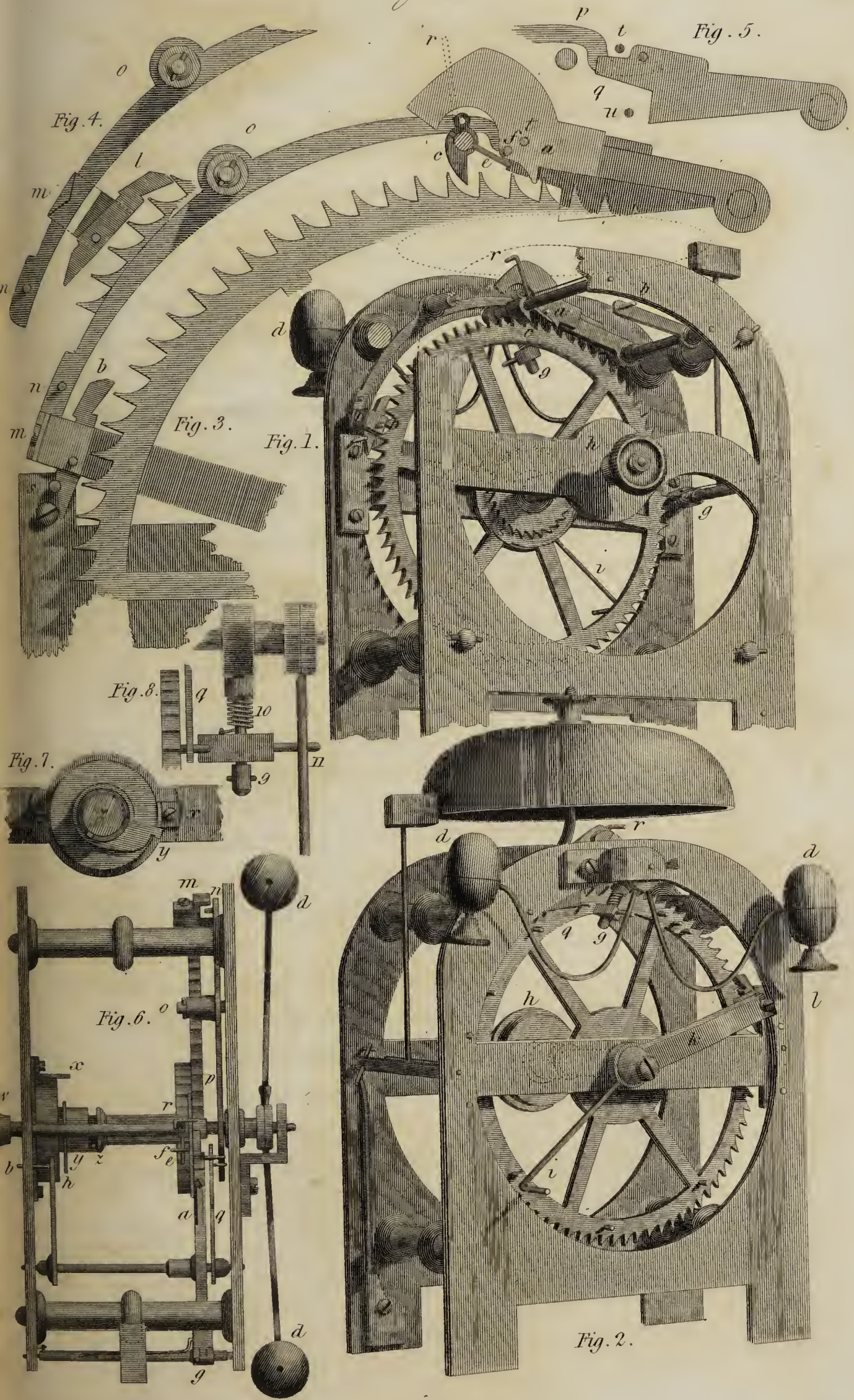
I HAVE once more taken the liberty to send you a new Machine, or the striking and repeating part of an eight-day clock, of my invention and workmanship, which I had nearly finished two years ago. You will much oblige me by laying it before the Society for the Encouragement of Arts, &c. the first opportunity.

This invention strikes the hours, and repeats them with only one wheel without fly, or pinion, rack, or step-wheel.

In repeating it has the advantage of not letting the spring or weight go down in any degree, but is just the same as if it had not repeated at all, which has never been done before that I know of in any clock which strikes every hour as the time passes.

The

# Mr. Prior's striking part of a Clock.




Drawn by C. Varley.

Engraved by S. Porter.

The centre of gravity of the two vibrating brass weights is below the centre of motion, otherwise it would not vibrate and keep time to unlock the detent that the hammer may strike the bell at proper intervals.

This horizontal vibrating motion, is a substitute for a train of wheels and pinions, the superiority of which may be known by asking this question: Whether will a train of wheels and pinions, or the striking part of a clock, take more power to turn the fly with the same velocity as when striking, having nothing to do with the hammers in either case.

The Committee will find this machine to stop when wound up by a method entirely new (at least it is so to me). I think it the best stop yet made for any machine which requires more than one turn.

When this has been examined as a striking part, please to take off the bell, and consider it as having no hammer or vibrating balls, or weights, &c. then it will be found to do for an Escapement for a Pendulum, which will give it one impulse every vibration.

I have the honour to be, Sir,

Your most obliged humble Servant,

JOHN PRIOR.

*Nessfield, near Skipton in Craven, Yorkshire.*

To C. Taylor, M. D. Sec.

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*Reference to the Engraving of Mr. John Prior's striking and repeating part of an eight-day Clock. Plate* 11.

Fig. 1. The clock with a corner of the plate taken away to show the escapement; when striking the regular hours, the detent *a* is unlocked by the pin *b* being raised, the tooth then falls

on

on the pallet *c*, which puts the vibrating balls *d d*, (see fig. 2) in motion, and they in returning, unlock the detent *a*, by means of the pin *e* which raises the detent pin *f*; and every tooth that passes strikes one by lifting the hammer pallet *g*; the spring that turns the count-wheel is in the box *h*.

Fig. 2. The other side of the clock, with the count-wheel stopt after striking four; to repeat the hour, the arm *i* is brought down, which raises the arm *k* carrying a click *b*, (seen best in figs. 1, 3 and 4.) at the back of this click is a bevel stud *m*, figs. 3 and 4, which in passing and re-passing depresses the pin *n* of the long stud-click *o*, this by its other end *p* raises the click *q*, (fig. 5.) and enables the fourth pin of the count-wheel to pass; the click *l* then brings back the count-wheel, till the third pin stops against the click *q*; the arm *i* is then brought up, which makes the click *l* repass the pin *n* and thus unlocks the detent *a*, and the hours are repeated, and thus asmuch of the spring is wound up as is required to repeat the hour; the detent *a* rises or falls without the click *q*; but the click *q* cannot rise without lifting the detent, by which the stud click *o* answers the double purpose, first, of liberating the count-wheel to go back one hour, and then of unlocking the detent to strike that hour: the click *q*, is only a repeating stop. R is a guard-hook to secure the detent down, while the tooth escapes the pallet *c*, the pallets *c* and *g* are moveable to let the count-wheel go back, and are kept in a right position by springs.

S, fig. 3, is a pin to keep the click *l* out of the teeth; the pin *t*, fig. 5, belongs to the detent *a*, and *u* is a count-pin.

Fig. 6, a bird's-eye view of the movement: *w* the nut for winding up the spring, *h* the spring box, *x* a stop, *y* the moveable stop, which allows the spring to make one turn and three quarters between the stop *x* and the pin *z*.

Fig. 7, the spring box and stop. Fig. 8,

# Mr. James Jones's self-adjusting Crane.

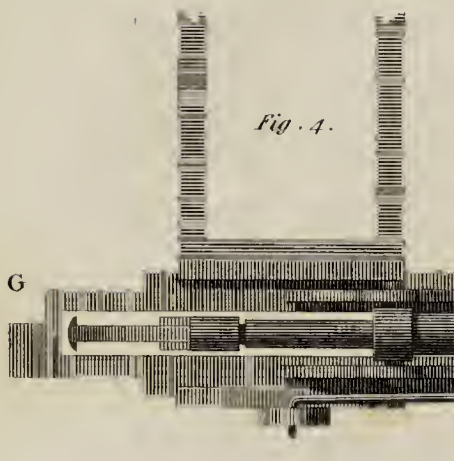



Fig. 4.

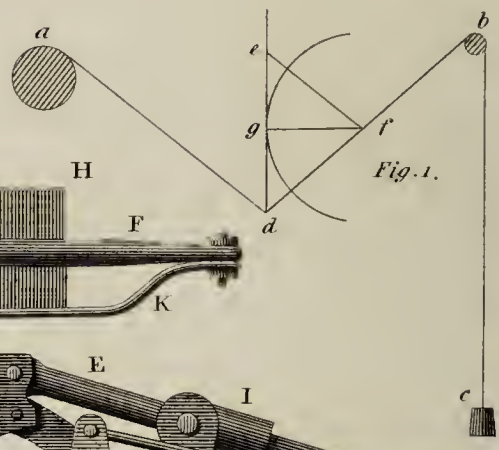



Fig. 1.

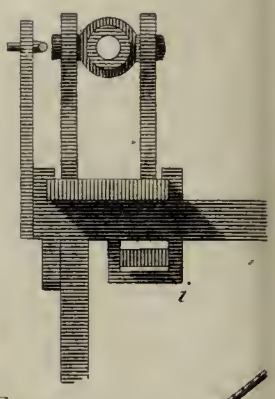



Fig. 5.

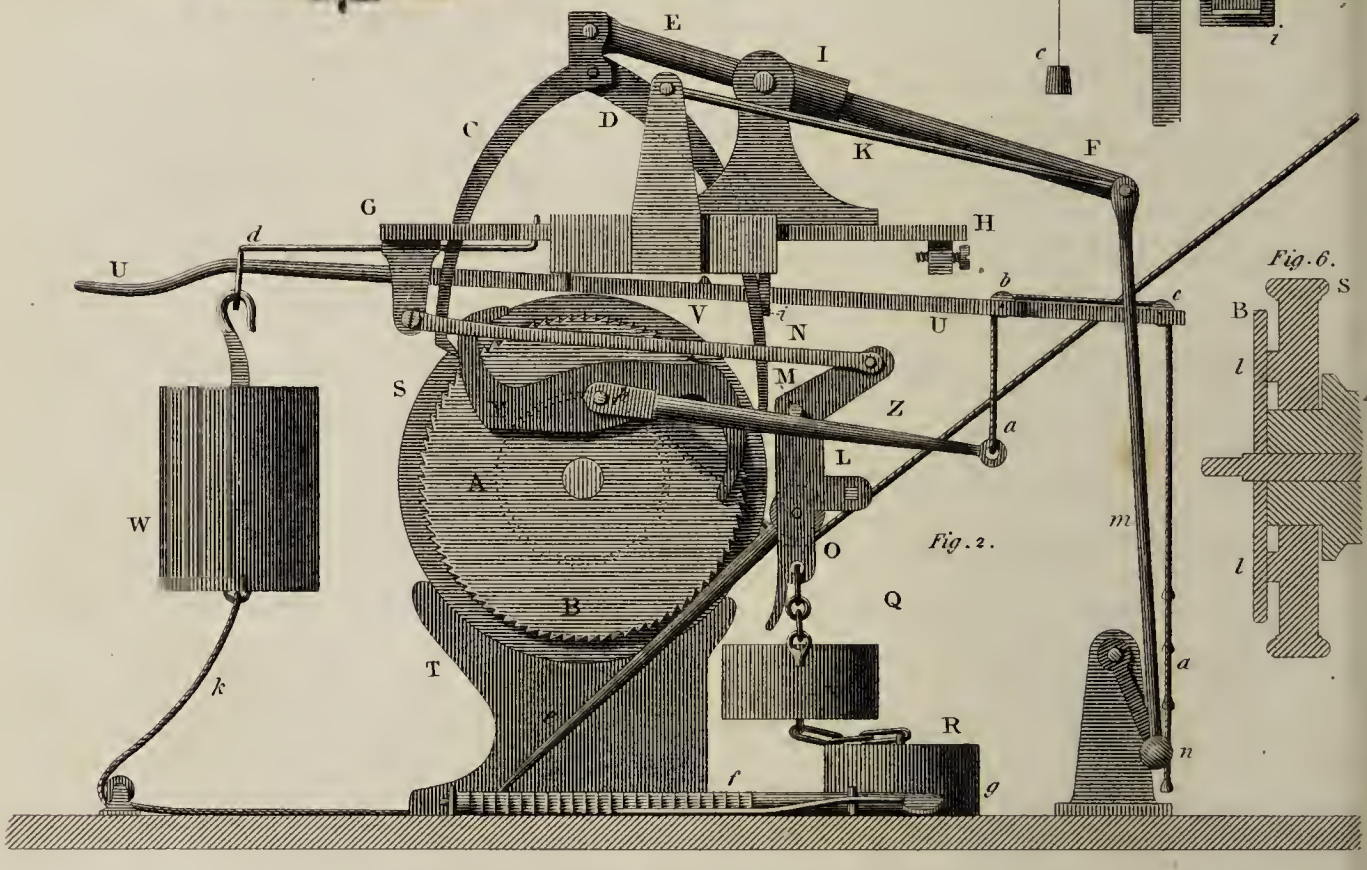



Fig. 2.




Fig. 6.

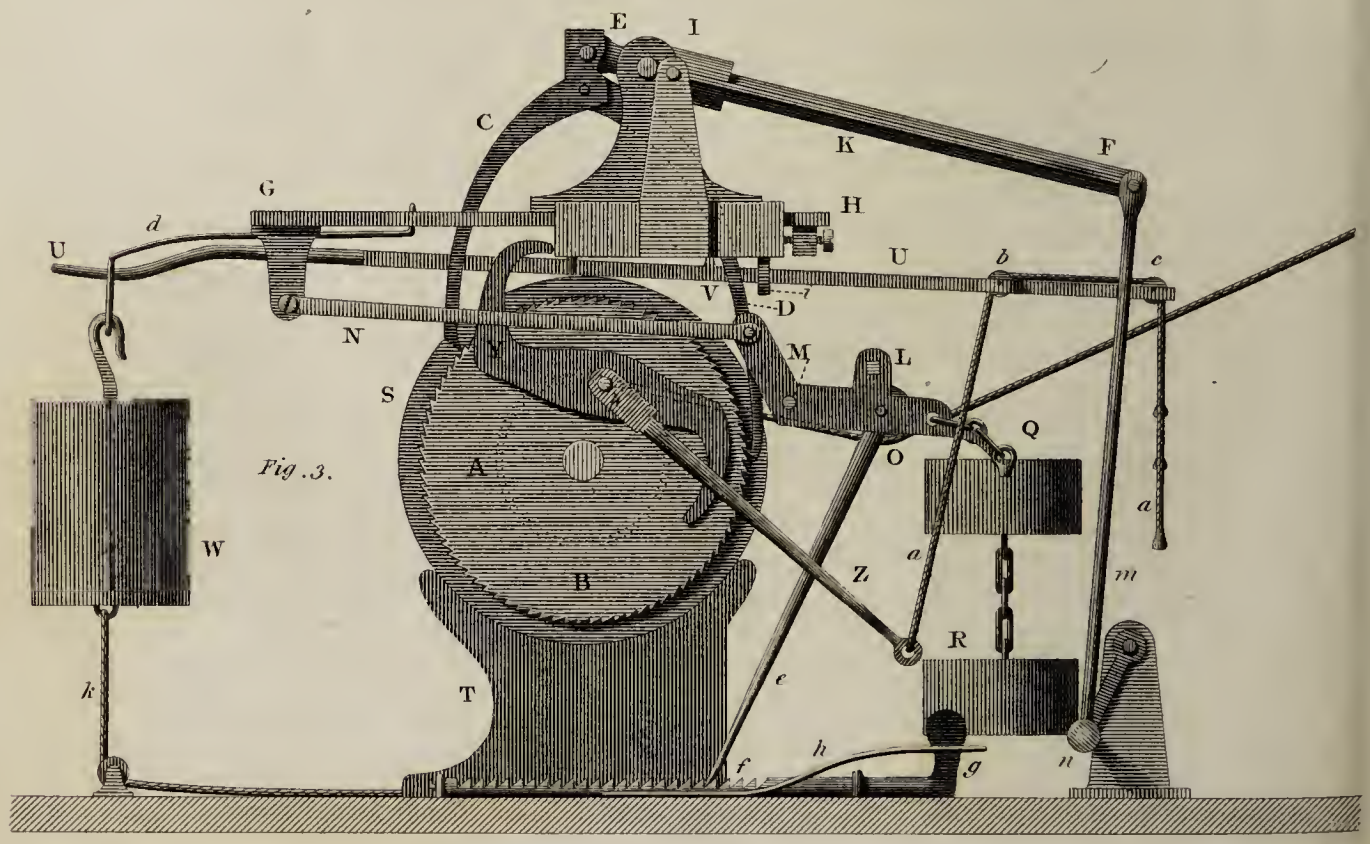
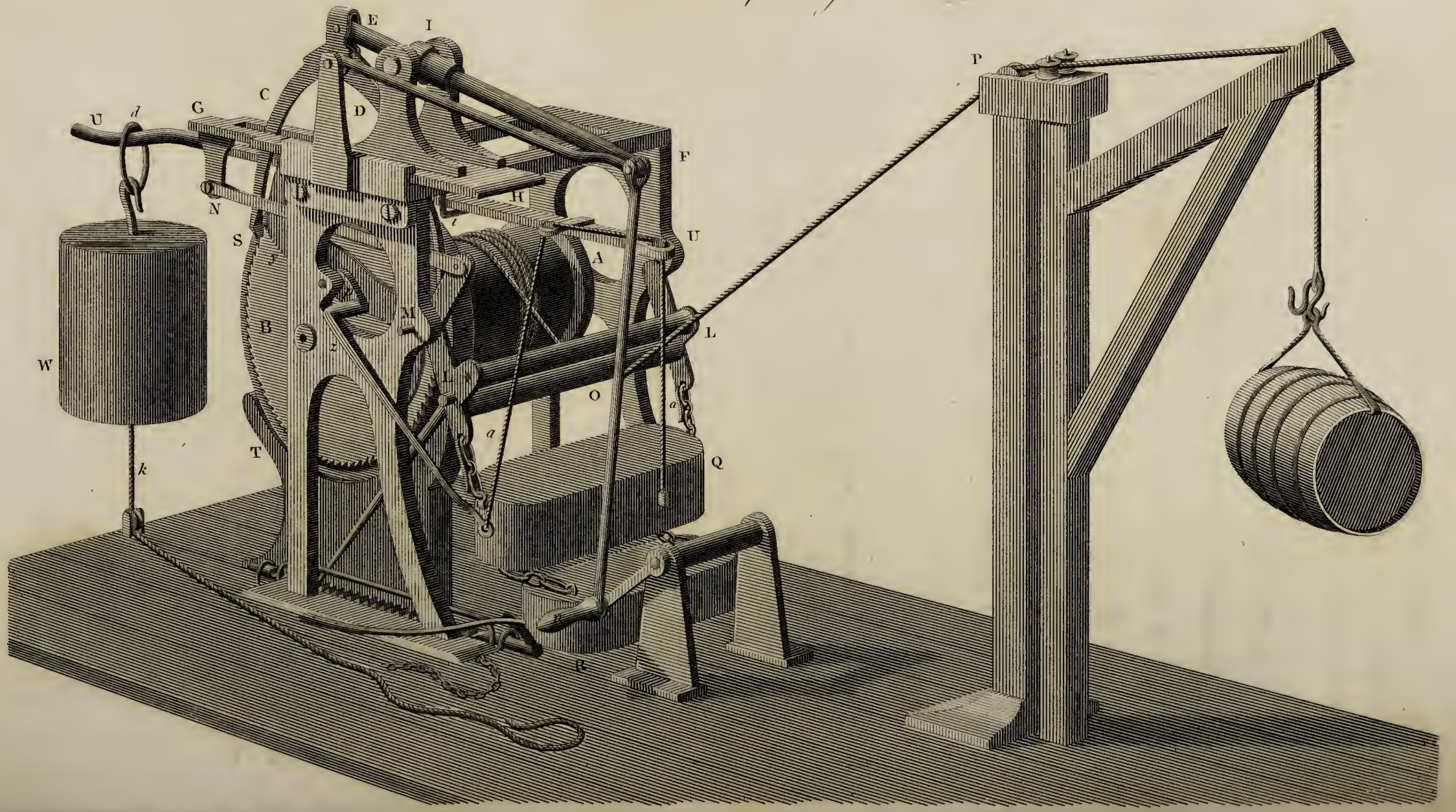



Fig. 3.

Drawn by Cornelius Varley.

Engraved J.B.Taylor.

# Mr James Jones's self-adjusting Crane.




Drawn by C Varley

Engraved by J H Taylor

Fig. 8, shows full size the moveable pallet g, which stops the vibrating balls against the count-pin, the tail 11 acting against the wire of one of the balls; 10, a spiral spring to keep it right.

The figures, 3, 4, 5 and 8, are full size, 6 and 7, half size.

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*The* GOLD ISIS MEDAL *was this Session voted to Mr.* JAMES JONES, *of Holborn, for a self-adjusting Crane. The following Communications were received from him, and a Model of the Crane is preserved in the Society's Repository.*

SIR,

I BEG leave, through you, to present to the Society for the Encouragement of Arts, Manufactures and Commerce, the accompanying model and description of a crane, on a new principle, for their inspection.

I remain, Sir,

Your obedient humble Servant,

JAMES JONES.

150, *High Holborn, May,* 1817.

To A. AIKIN, Esq. Sec.

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IN a country so entirely dependant on its commerce as Great Britain, every means of facilitating its operations becomes of the highest importance, and every improvement, however small, that can be effected in the agents necessarily employed, must, I think, merit the attention of those who are most materially interested in its prosperity. Impressed with this

this belief, and earnestly desirous of contributing my mite to the general stock of knowledge, I have lately directed my attention to a subject of some importance in the removal of goods, namely, *Crane-work;* and the result of my consideration I now respectfully submit to the Society for the Encouragement of Arts, Manufactures and Commerce, for their inspection.

The defect usually attributable to cranes is, that it is necessary to pass through as much space to raise a light load as a heavy one, unless an alteration be made in the relative velocities of the power and the load, by manually changing some wheel or pinion. To obviate this objection (which on public wharfs in particular, when almost every succeeding load varies in weight from the one last raised, is a very material one) was the purpose I had in view, and as I conceived that cranes possessing the property of spontaneous regulation would be a near approach to perfection, my attention was more particularly directed to that point, that is, to preserve at all times an equilibrium between the power and the weight, as nearly as possible, without much additional care or trouble to the labourer employed; and to effect this desirable purpose, I have endeavoured so to contrive the parts of a crane as that the attendant should scarcely be aware of the difference of the weights he is raising, but by the greater or less time required in the operation, the intensity of exertion remaining in all cases the same.

As the means by which I raise the load are different from those which are usually employed in cranes, that is, by the Universal Lever, it may not be improper (previous to detailing the manner of application) to describe it, as there are doubtless many persons unacquainted with the instrument so called. The Universal Lever consists of a large vertical

vertical ratchet-wheel attached to a barrel round which a rope winds drawing up the weight. Immediately over the wheel in the same vertical plane is fixed a lever of the first order, the end of the shorter arm being directly over the axis of the wheel; there are two rods of iron jointed to the end of the lever, one terminating in a broad flat point, and the other in a broad hook; if the longer arm of the lever is depressed, the hook attached to the short end having taken hold on a tooth on one edge of the wheel draws that side of the wheel upwards, whilst the broad point passes freely over the the teeth on the other side; but if the longer arm is raised, the contrary operation ensues; the hook looses its hold whilst the broad point, dropping into a tooth, thrusts that side downwards, and the hook proceeds down freely on its own side preparatory to taking a fresh hold. Thus, by continually working the lever up and down, its reciprocating motion is converted into a rotatory one in the wheel and barrel, thereby raising the weight attached to the rope.

Probably an objection may be here offered, that the motion of the load upward is always discontinuous, and effected by a succession of jumps occasioned by the regularly intermitted efforts of the two claws. To such objection (if it should be found to be a material one,) I would propose as an effectual remedy, the application of a fly-wheel.

Thus the application of the Universal Lever to the purpose of raising weights, not being new, so far I have no pretensions to originality; but a principle of self-adjustment, comprised in the variation of the proportionate lengths of the two arms of the lever, and that variation effected by the agency of the load to be raised, independent of the personal interference of the labourer employed, and such as I have

here

here introduced, is, so far as my knowledge goes, entirely new.

The basis of my method of regulation is simply this; that if one end of a line is fixed, and the other end, having a weight attached, is passed over a pulley at some lateral distance, that part between the point of fixture and the pulley will, of course, form a right line; but if another weight is hung on between those points, the line will be drawn down more or less, according to the relative proportion of the two weights. Thus, let *a*, plate 12, fig. 1, represent the point of fixture, *b* the pulley, *c* the weight hung to the end of the line, and *d* the weight attached to the middle or any other part of the line, then draw *d e* perpendicular to the horizon, and *e f* parallel to *a d*, so will *e d* represent the weight fixed to the middle of the line, and *d f* the weight suspended from the end; thus it is evident, that as the weight *c* is increased or diminished, the weight *d* rises or falls, until the lines *e d* and *d f* bear the same proportion to each other as their respective weights. What those respective weights are, resulting from any given inclination of the lines with the horizon, may be determined with the greatest accuracy and facility by trigonometrical tables, or by the lines of secants and tangents, either on the plain or Gunter scales. Thus, nearly in the words of Gravesande, (Math. Elem. vol. I. page 96,) if the triangle *d e f*, a line *f g* be drawn parallel to the horizon, and that line be taken for the radius of a circle of which *f* is the centre, *d f* will be the secant, and *d g* the tangent of the angle which *d b* makes with the horizon, and *e f* will be the secant, and *e g* the tangent of the angle which *a d* makes with the horizon: whence it appears that the weight *d* is proportional to the

sum

sum of the aforesaid tangents, and the weight *e* proportioned to the secant of *d*.

Such is my principle. The manner of its application in the construction of a Crane (referring to the accompanying engravings, wherein the corresponding parts of each figure are designated by the same letters), is as follows.

Plate 12, is a perspective view of the Crane compleat.

Plate 13, fig. 1, is elucidatory of the first principle, as before detailed.

Figs. 2 and 3, sections without the frame-work, shewing the positions of the parts at different periods of their operation.

Fig. 4, a bird's-eye view of the slider, perforated fulcrum, and great lever.

Fig. 5, an end view of the slider and perforated fulcrum, and of the staple *i*, on which the brake-lever takes its bearing, when, by means of the relieving rope, it is raised off the brake-wheel.

Fig. 6, a section of the end of the chain-barrel, brake-wheel and toothed wheel, and shewing, by the two projections *b b*, the situation of the teeth on the outer face of the brake-wheel, and in which the clicks on the inner face of the toothed wheel take hold in lowering.

A, is the chain barrel, B the wheel on which the claws of the lever operate, C D the two claws jointed to the end of the great lever, E F G H is the slider sustaining the fulcrum of the lever, I the perforated fulcrum or socket, similar in shape to the middle part of a cannon cut off on each side of the trunnions, on which, as on two pivots, the lever performs its alternations, whilst the fulcrum occasionally slides along it. K is a rod jointed to the end of the lever at one end, and moving on a centre pin in a standard

fixed to the frame work of the crane at the other, so as to prevent any longitudinal motion in the great lever; L is the regulator, being a frame hanging from the centres M, on which it turns upwards; N is a rod connecting the top arm of the regulator with the slider G H; O is a roller (contained in the frame of the regulator,) under which the crane rope or chain passes from the gibb (after having gone over the pully P) to the chain-barrel A; Q is a weight suspended from the regulator; R is another weight suspended at such distance below Q as to rest on the floor, and consequently does not come into action until the regulator and the other weight have attained a considerable elevation, sufficient to draw the intermediate suspending chain tight. These weights, it is evident, will, by the common action of gravity (unless prevented by some external means) retain the regulating frame in a vertical position, and the sliding fulcrum at its greatest distance from the wheel end of the lever, and consequently, when the lever is worked, produce motion in the wheel, amounting to a revolution at each alternation; but if the load is hung to the end of the rope, the endeavour of that load to form the rope into a right line gives the regulator a tendency to rise; and if the load is increased, thereby increasing the degree of tension, the regulator rises still higher, and by means of its top arm and connecting rod, slides the perforated fulcrum closer up to the head of the lever, which causes the wheel to move through a smaller arch of the circle, corresponding with the altered proportion of the length of the two arms of the lever, thus augmenting the effect of the power applied to the other end in nearly the same ratio as the addition to the load.

It will be readily seen that the manner of working the crane to raise a load, is either by the alternate elevation and

depression

depression of the lever by hand, as in working a common pump, or by the usual method of turning a winch *n*, which, by means of the rod *m*, communicates its motion to the great lever, It will also be seen (as I have before observed,) that the regulator rises in proportion to the intensity of the load, thereby adjusting the length of the lever, so as to produce a near approximation to an equilibrium between the power and the resistance; for if the load raised be multiplied by the number of teeth which the claws pass over at each alternation of the lever, the prod ucts will be found to be nearly the same for all loads within the power of the model.

Thus I conceive, that if the parts of the crane are perfectly proportioned with respect to the power intended to be employed in working it, the effect will in all cases approach very near the maximum.

It is to be particularly attended to in practice, that the angle *a d c*. fig. 1, plate 13, must at all times be more acute than the angle formed by the rope coming from the barrel to the roller O, and a line erected perpendicular on the roller must not contain so many degrees as the angle formed by that same perpendicular and the rope passing from the roller to the gibb, otherwise the regulator will not rise at all; for if the angles are equal, or if *a d c* is greater than *e d b*, the more intense the strain upon the crane-rope, the stronger will be the tendency of the regulator to retain its vertical position, or rather to turn backwards, thus depriving it of the governing influence it ought at all times to possess over the great lever; and I would suggest, by the way, that an index attached to the regulator would roughly indicate the weight of the load, and doubtless might be

constructed so as to shew the weight with considerable accuracy.

The parts necessary to lower a load are these: On the end of the barrel is placed a large gripe or brake-wheel, T, which turns freely on the neck of the barrel in one direction, but is prevented from turning the contrary way by having ratchet teeth cut on its outer face, (as shown by the two projections *l l* in the section, fig. 6,) which being taken hold on by a click or clicks affixed to the inner face of the great wheel, B, obliges it to take the brake-wheel with it, when it attempts to turn backward. T is a segment of wood fixed firmly to the floor, and into which the brake-wheel S is forcibly pressed by the lever U U, which, taking its upward bearing by means of the protuberance V against the top of the frame work of the crane, the other end is held down upon the wheel by the action of the weight W, so that during the operation of raising a load, the brake wheel stands still, the neck of the barrel turning freely within it, and the click of the one passing without obstruction over the teeth of the other, it will be seen, that as the regulator rises or falls, the brake-weight W, is projected out farther from, or drawn in nearer to, the crown of the wheel, by means of the projecting rod *d*, which, connecting the weight with the sliding fulcrum, obliges them both to partake of the same motion, so that when the sliding fulcrum is in the most favourable situation for raising the load, the brake weight is also placed on that part of the lever proper to give the requisite degree of pressure to prevent the load from descending. It will also be noticed, that the end of the lever is bent obliquely downward, so as to form an inclined plane; the purpose to be effected by this bending is the assistance given by the brake-weight to the first rise of the regulator, when the load is but small. As it is evident

that

that the chain-barrel cannot turn back to allow the load to descend, whilst the claws remain in contact with the teeth of the wheel, it becomes necessary, previous to lowering, to disengage them from their hold; to effect this, there is placed in the frame-work by the side of the wheel a plate of iron Y, of a peculiar form, called from its office the reliever, turning on a centre-pin *p*, and moved by the handle Z. To the end of this handle is attached a rope *a a*, which passes over two pulleys *b c*, in the end of the brake-lever, and hangs down by the side of the winch so as to be conveniently within reach. The operation of lowering is this; the winch being placed in its lowest situation, the labourer by pulling the relieving rope *a a* raises the handle of the reliever, which, by bringing the two opposite points which are most extended from its own centre-pin into contact with the ends of the two claws, detaches them from their hold on the wheel, as in fig. 2. The load would then descend by its own gravity; but the pressure of the weight W, which is always in action, being exerted to force the brake-wheel into the segment T, produces so great a degree of friction as will effectually prevent its descent, and the load consequently remains suspended, but a stronger pull on the relieving rope, (as the handle of the reliever cannot rise above a certain height) must necessarily depress that end of the lever, which changing its fulcrum by losing its bearing against the upper part of the frame at V, exerts less power on the crown of the wheel, and consequently allows the load to descend just as gently as the attendant pleases, and when it is necessary for the rope to be drawn out preparatory to raising a fresh load, a still stronger pull, by depressing that end of the lever so far as to take its bearing on the staple or cleat *i*, more plainly seen at fig. 5, raises the middle part of the lever entirely off

the wheel, when a very small power is sufficient to draw the rope out as far as may be required.

The advantage I expect to obtain from the great weight on the brake is, that any load within the intended limits of the power of the crane will never be sufficient to overcome the resistance offered by the parts of the crane intended for that purpose, and consequently it never can descend but at the will and by the assistance of the person attending it, which, together with the security derived from the inherent property of the universal lever, of the efforts of the two claws on the opposite points of the periphery of the wheel always balancing each other, endues it with the valuable property of perfect safety.

After a load has been raised or lowered, and it becomes necessary to detach the ramshead or hook from the load, it would be found almost impossible to do so, in consequence of the regulator bearing with all its weight on the rope or chain, and thus keeping it at its previous degree of tension. To obviate this objection, I have made the following addition: *e* is a leg or prop loosely jointed to the regulator, which, as it rises, draws the end of the prop over the teeth of a rack, into which it takes firm hold when the regulator attempts to descend, thus affording it a sufficient support whilst the load is disengaged: *f* is the rack, being a cylindrical rod of iron having serrated teeth cut all along one side, and turning on pivots at the ends; attached to the rack is the treadle *g*, (supported by a spring *h*, as shown in fig. 3,) which being depressed by the foot of the labourer at the commencement of each lift, as shown in fig. 2, is made to perform part of a revolution, thereby presenting a plane side of the rack upwards, and consequently disengaging its teeth from their contact with the end of the prop, and thus allows the regulator to descend to its original situation.

As

As in some cases it might be desirable to employ more hands than the crane was originally constructed for, it would be necessary to prevent the rise of the regulator beyond a certain height by confining it down to its proper situation by a hook and chain affixed to the floor, that being a more simple method than the addition of more weight, as in this case, (supposing the load to be exceeding heavy) a greater degree of power would be required to be exerted on the brake when lowering. To effect this, I would attach to the brake-weight a rope *k*, and passing it under a pulley fixed to the floor, bring it to the labourer's hand, by which means he might give the requisite degree of pressure; and as it may happen at times that there may be many succeeding loads of nearly the same weight, it might be advisable, after the first lift has brought the regulator to its proper situation, to fix it there by means of the prop, and the hook and chain, thereby preventing the necessity of raising the regulator at each of the remaining lifts which may be of the same weight.

It may be proper to state, that I do not offer this model to be strictly copied for a crane of the full size, for I am quite aware that the arrangement of its constituent parts will admit of much improvement in the practical execution, and the necessary modifications would doubtless alter the form of it materially. It is only the principle I offer to the Society's consideration; and the approbation of a new principle, such as I think I am justified in stating this to be, is seldom found to possess so great a degree of perfection as practice renders it susceptible of; for this reason I trust I shall meet with the Society's indulgence for whatever imperfections of construction it may be found to labour under.

In conclusion, I have only to repeat that the Universal Lever, being an old and well known contrivance, so far as

that alone is concerned, I can have no claim; but the principle of spontaneous adjustment, whereby the load, in all cases, is raised with the least possible expenditure of power and time, and that with absolute safety to the persons employed, will, I trust, prove to be perfectly original; what degree of merit it possesses remains for the Society to determine, and I beg leave to add, that should it be found deserving the Society's approbation, that circumstance will be to me the highest gratification.

J. JONES.

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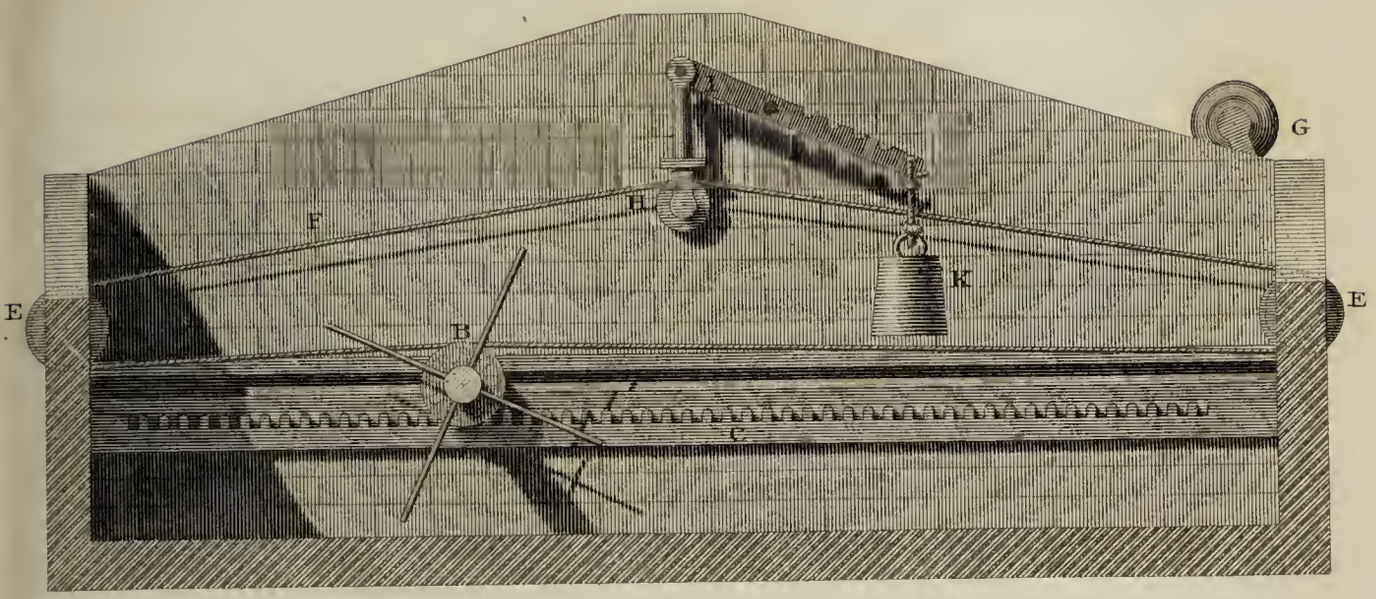
*The* SILVER MEDAL *was this Session voted to Mr.* R. W. BARCHARD, *of Waddon near Croydon, for a cylindrical traversing Rake, for the purpose of stirring Tobacco, Malt, Corn, Hops, Mustard, or any kind of seed, &c. The following Communications were received from him, and a Model of the machine is preserved in the Repository of the Society.*

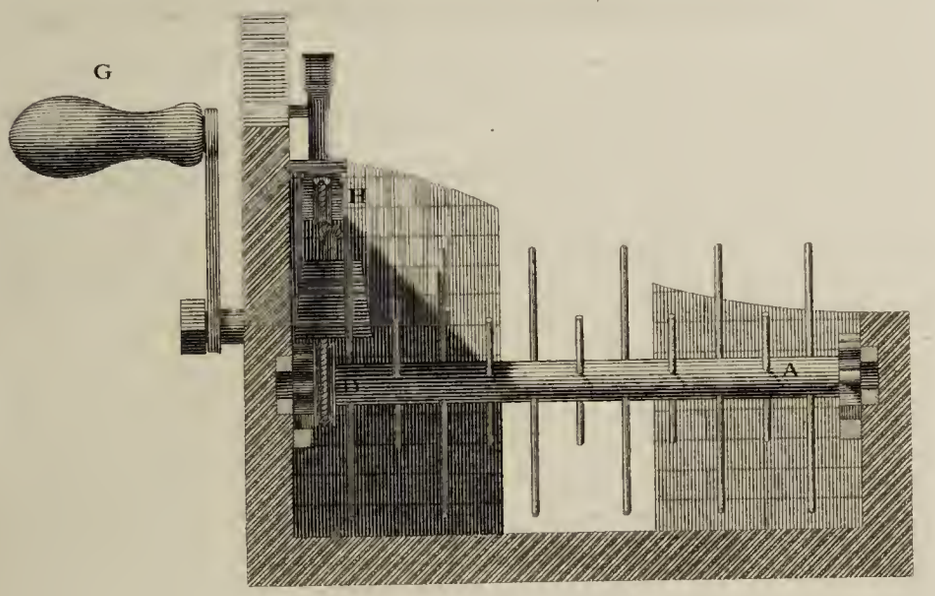
SIR

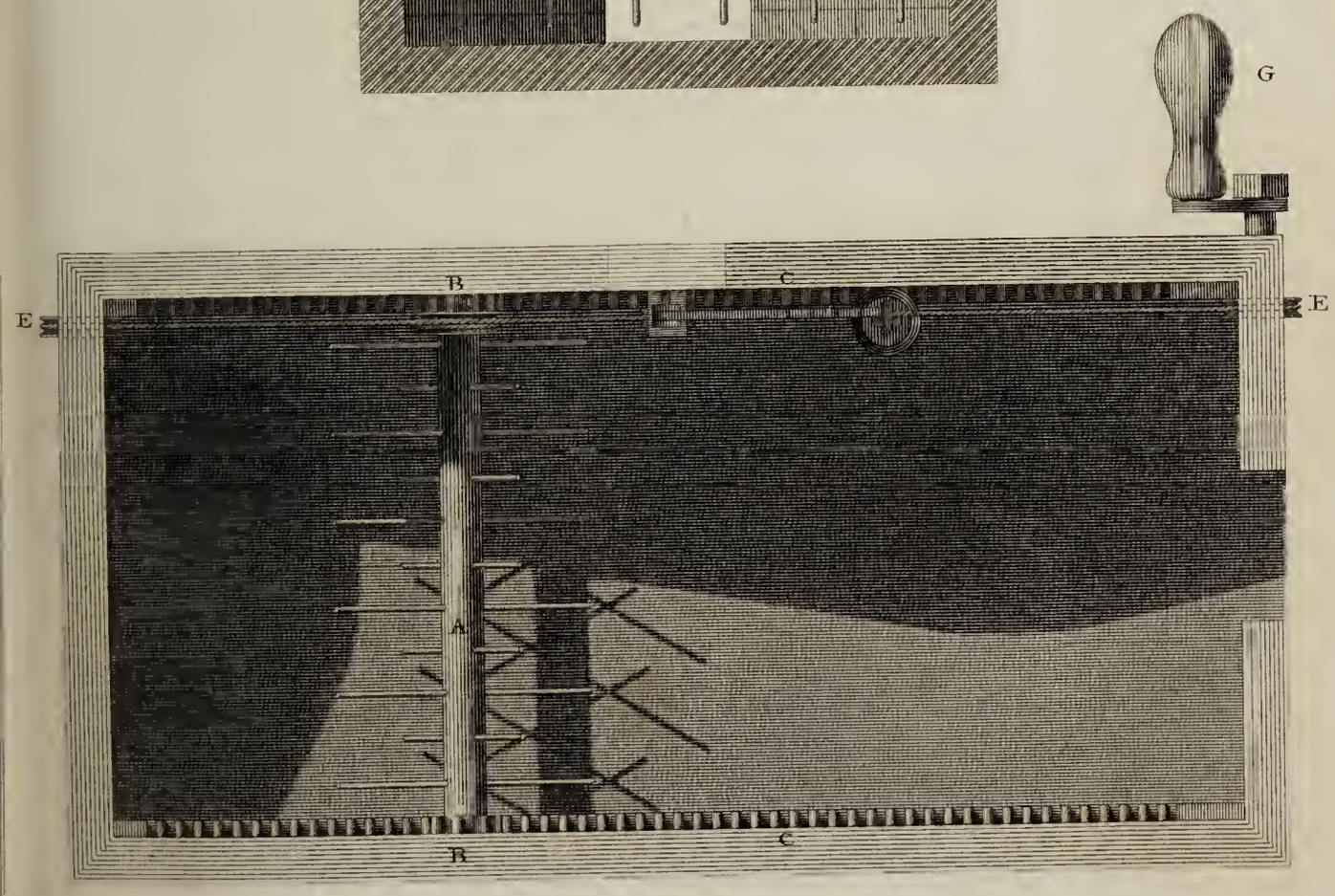
I BEG leave to lay before you the accompanying model of a machine, invented entirely by myself, and erected from my model by Mr. Webb, at his snuff mills at Beddington, Surry, for stirring together tobacco when drying on the kiln, the fumes arising from which are so powerful, as to render it hardly possible for a man to go in, until he has thoroughly ventilated the kiln, by drawing up the windows, &c.

The above model is not made to any particular scale, as the

# Mr. W.m Barchards Cylindrical Rake. Pl. 14.




A. Nicholson Delin. Engraved by Ja.s Davis.

the proportions must depend on the place in which it is erected, and the articles intended to be moved by it. I think I need not enter into any farther description, than merely to say, than on each side of the kiln there must be a rack and groove for the pinion and gudgeon to move in, with a pulley at each end to carry the rope or chain, and a small pulley in the middle with a weight suspended, to keep the rope tight enough to turn the rake, the teeth of which must be adapted to the goods it is intended to move. Should the door of the kiln be most convenient at the side, as it is at Beddington, the rack and groove are made to turn back on a hinge, thus leaving the door-way clear for the workmen to carry in fresh goods, or to take out those already dried. The handle also may, by a small bevel wheel, be brought to the end or side, which ever is found most convenient.

I remain, Sir,
Your's respectfully,
R. W. Barchard.

*Waddon near Croydon, March* 1, 1816.

To C. Taylor, M. D. Sec.

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Certificates.

SIR,

A machine for stirring tobacco was erected atBedding ton mills, about two years since, of Mr. Barchard's construction, which has been found to answer the purpose.

I am
Your obedient Servant,
Wm. Prior.

*Beddington, November* 29, 1816.

To C. Taylor, M. D. Sec.

The

The accompanying is a perfect model of the rake, &c. invented by Mr. Robert Barchard, and erected at the snuff-mills at Beddington, for the purpose of stirring the tobacco when drying, preparatory to its being ground for snuff. It has been erected two years, and I have no doubt of its answering.

WILLIAM PRIOR.

*Snuff Manufacturer, Beddington Mills.*

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*Reference to the Engraving of Mr. Barchard's Traversing Rake. Plate* 14.

Fig. 1, is a longitudinal section of the apparatus.

Fig. 2, is a transverse section.

Fig. 3, is a plan of the apparatus.

A, the rake, being a cylindrical wooden bar, in which are inserted long and short staves alternately, for the purpose of stirring the tobacco, &c. at different depths.

B B, toothed wheels at the extremities of the rake, which work in the racks C C, that are laid on each side of the kiln.

D, a pulley on one end of the rake, round which the rope makes a single turn.

E E, two wheels at the end of the kiln, over which the rope passes.

F, the endless rope, by which the motion of the handle C, is communicated to the rake.

H, the tightning pulley, suspended at one end by the lever I, at the other end of which is the weight K, in order to keep the rope in a state of perfect tension.

Fig. 1.

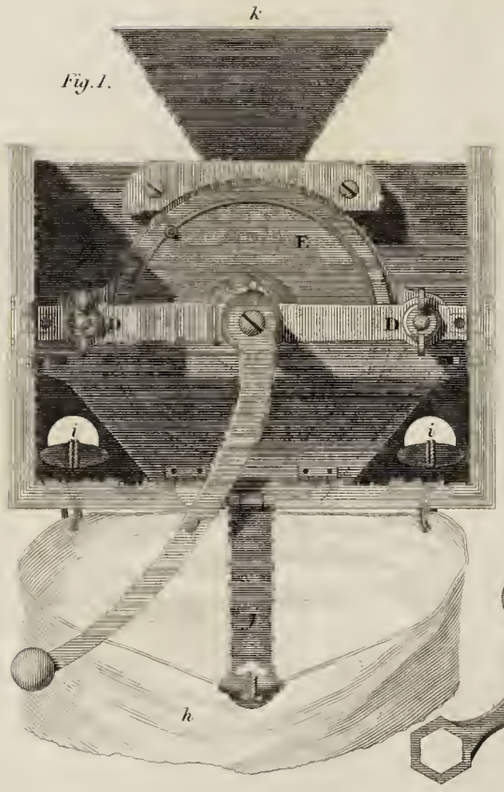



Fig. 2.

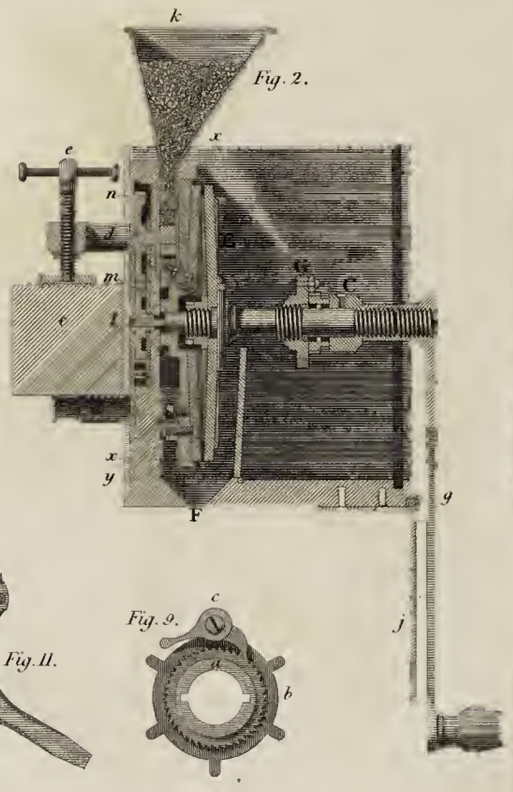



Fig. 7.

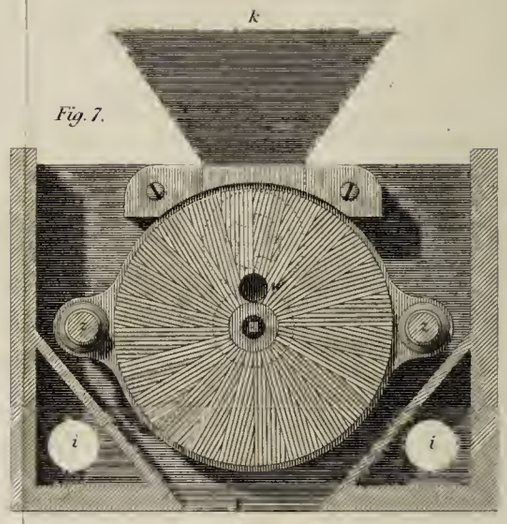



Fig. 11.

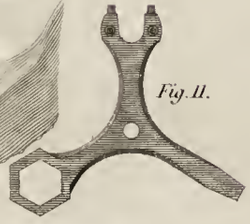


Fig. 9.




Fig. 5.

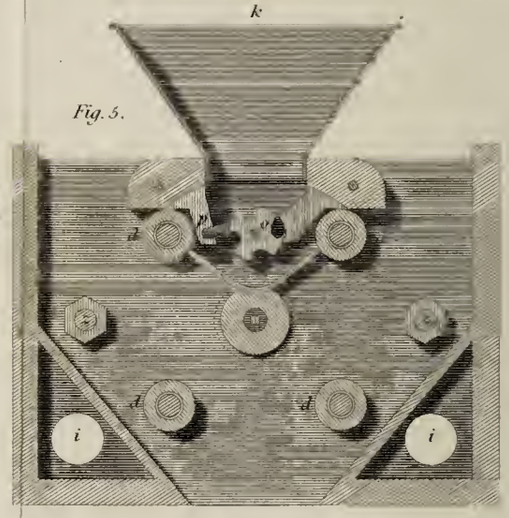



Fig. 3.

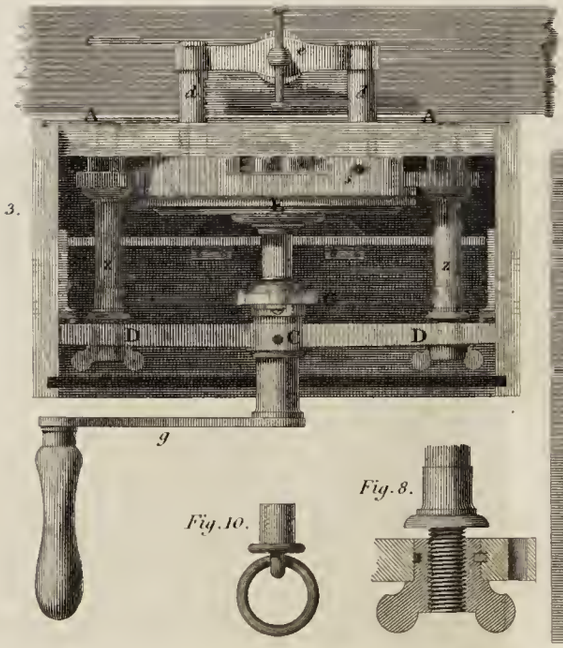



Fig. 4.

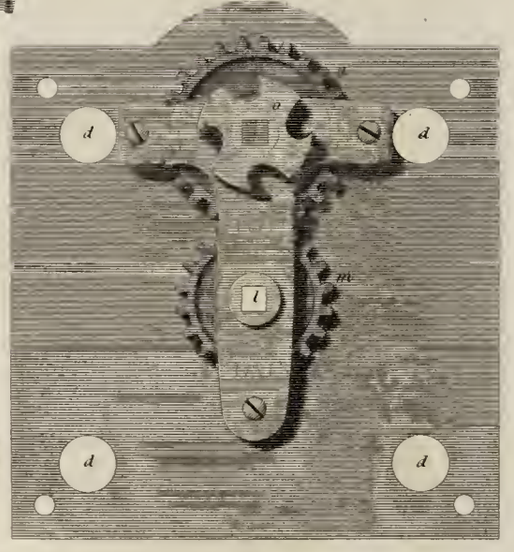



Fig. 6.

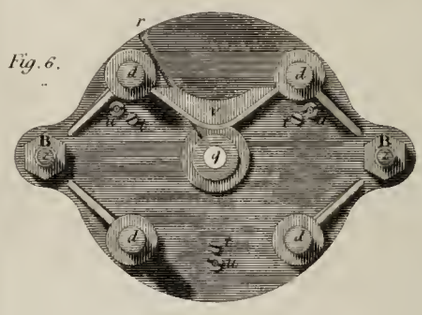
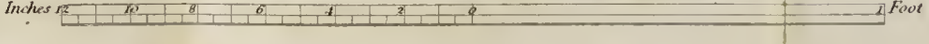



Fig. 10.



Fig. 8.






Drawn by T. Clement.

Engraved by James Davis

Fig 5.

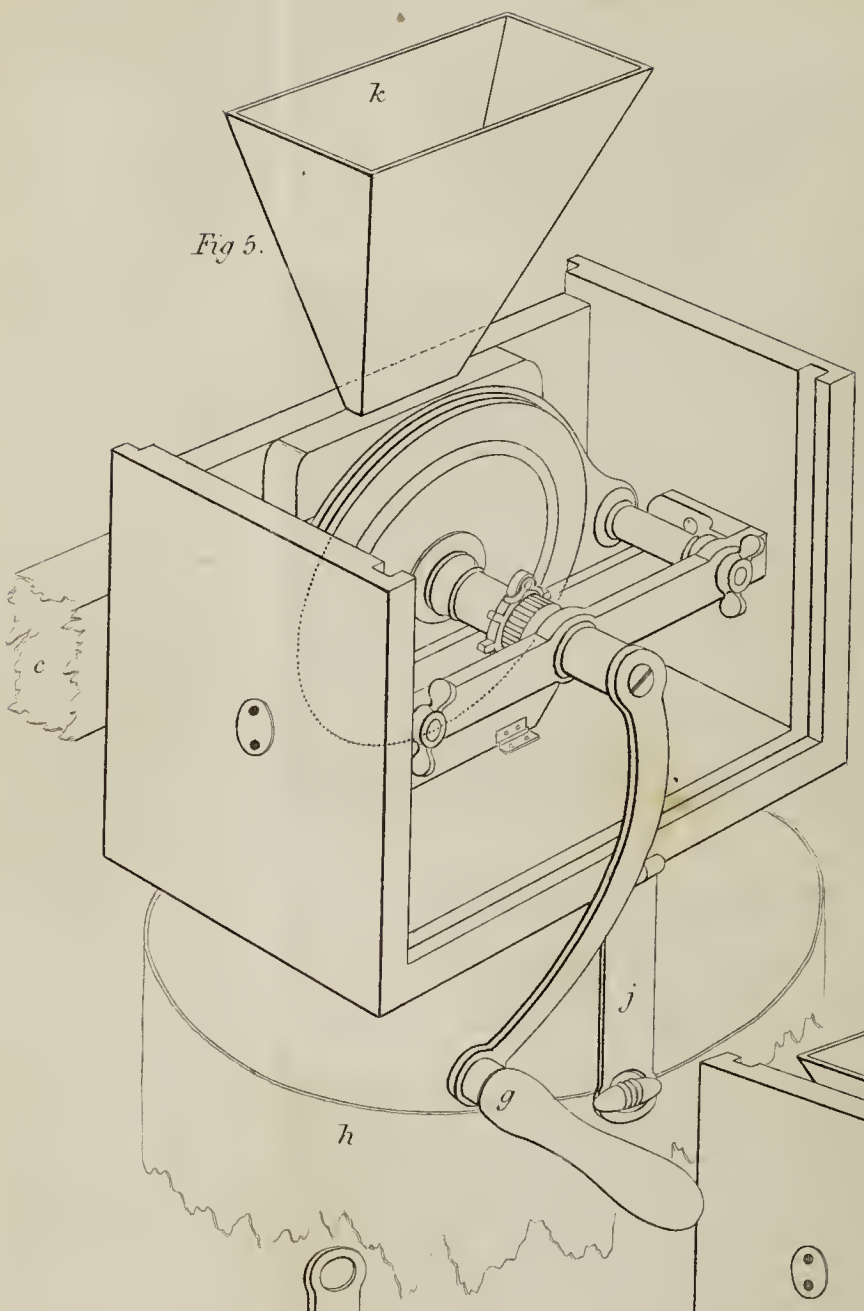



Fig 3.

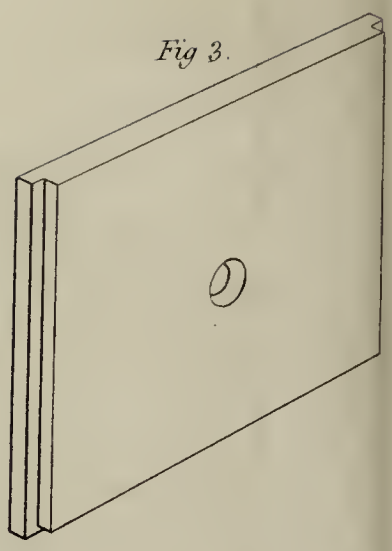


Fig 4.

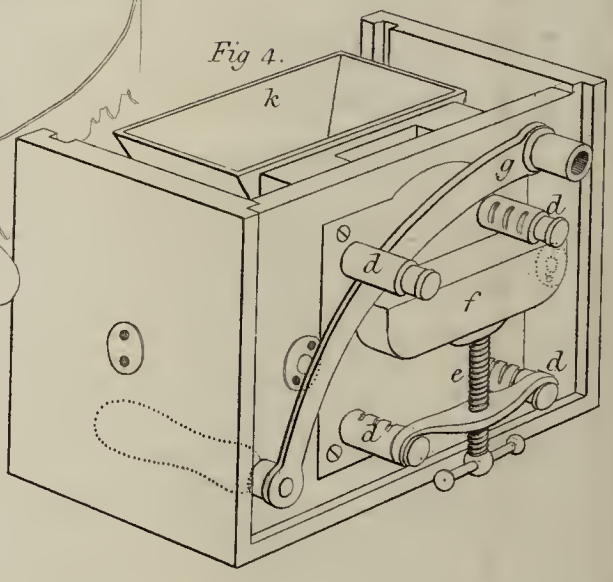



Fig 2.

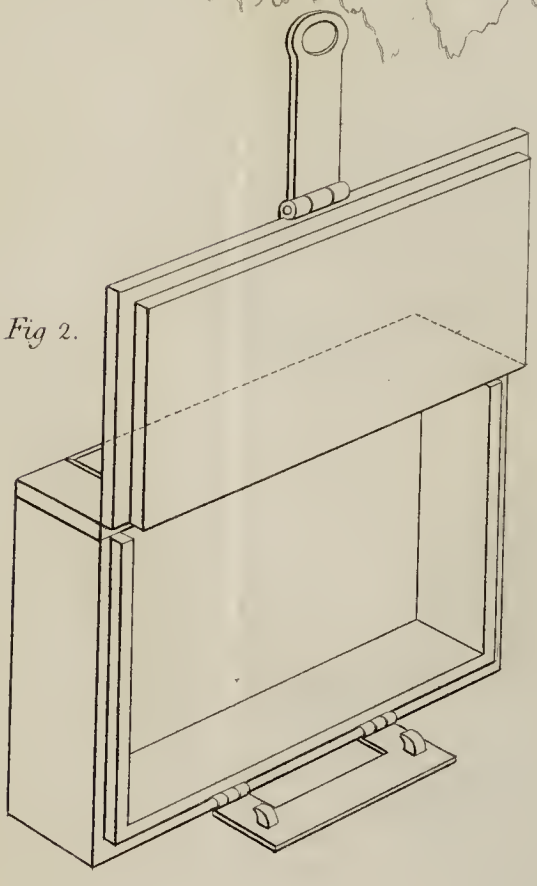
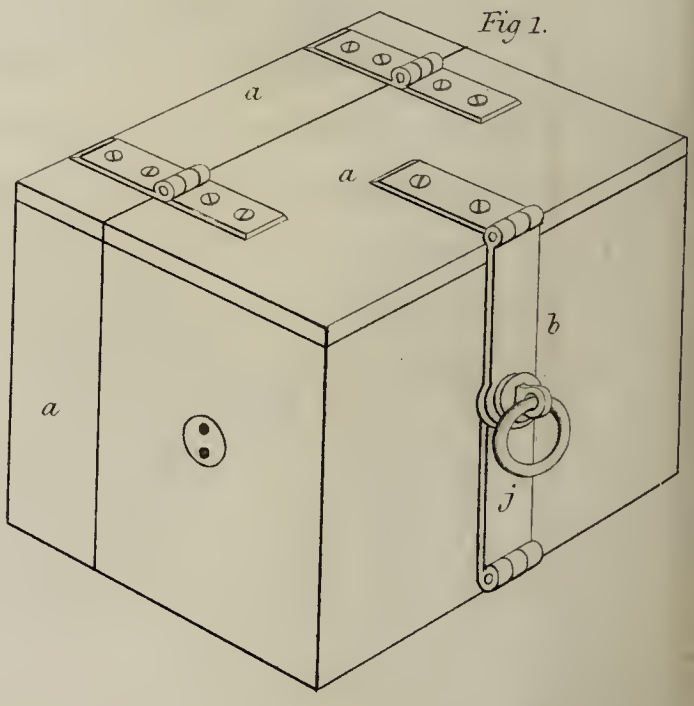


Fig 1.




J. Clement del.t

J. Davis sculp.t

*The* THANKS *of the Society were this Session voted to the Right Hon.* SIR JOHN SINCLAIR, *Bart, for his Present of a* MILL FOR GRINDING FLOUR. *The following annexed particulars have been drawn out by the Secretary, and the Mill is preserved in the Society's Repository.*

THE French portable military mill, presented to the Society, by the Right Hon. Sir J. Sinclair, is one of many thouands which were used by the French armies in foreign service, and particularly in the Russian campaign, in which, from the length and rapidity of the march, it was manifest that as great a reduction as possible of the heavy baggage would be necessary. On examination by the Committee of Mechanics, it appeared to combine in an eminent degree the qualities of portability, of simplicity and ingenuity of construction, of facility in making use of it, and of expedition in regard to the quantity of work done. The Society, adopting the recommendation of the Committee, resolved that a description of it should be inserted in their annual volume, in the hopes that it might be found useful, not only in an army on active or foreign service, but in workhouses, in prisons, in schools, and in private families. An ingenious mechanic, a member of the Society, has already manufactured a considerable number, which, from the ready sale and general approbation that they meet with, appear fully to justify the opinion entertained by the Committee, of the utility of the machine as a family mill.

The whole apparatus is contained in a box 14 inches square and 8 inches high, Plate 15, fig. 1. On unscrewing the ring, and

and removing the portions, fig. 2, (*a a a*, fig. 1,) and fig. 3, (*b*, fig. 1,) the mill is seen packed up, fig. 4. In order to fit it for use, the mill is to be fastened to a strong table, a cross-bar, a tree, a gun-carriage, or any other proper support which may happen to be at hand,(*c*, fig.5, Pl. 15, and fig. 2, Pl. 16,) by means of the four iron pins, *d d d d*, fig. 4. Pl. 15, the screw-bolt *e*, and if necessary, by the wooden block *f*; the winch *g*, fig. 5, Pl.15, is to be screwed on to the axle; the sack *h*, fig. 1, Pl, 16, is to be hung below the mill by means of three buttons which pass through the holes *i i* of the frame, and the hole at the extremity of the flat bar *j*; the hopper *k*, is to be fixed in the slit which communicates with the feeder.

The grain being put into the hopper, the mill is brought into action by turning the winch *g*, which is attached to the common axle of the machine from which all the other parts receive their motion. The farther extremity *l*, Pl. 16, figs. 2, 4, of the axle is square; and fits into a corresponding hole occupying the center of the toothed wheel *m*, which latter turns another *n*. On the axis of this last is fixed the feeder *o*, consisting of an iron wheel between two and three inches in diameter; the circumference of which has four notches or cells, for the purpose of receiving the corn and conveying it in due proportion to the grinding plates. The wheel *m* has 20 cogs, and the wheel *n* has 25, therefore 5 revolutions of the common axle occasion four revolutions of the wheel *n*, and of course convey the amount of 16 cells full of corn to the grinding plates: fig. 5, Pl. 6, exhibits a section of the hopper and the feeder, and shows a small brush *p*, which prevents the feeder from becoming choaked.

Fig. 6, Pl. 2, is a back view of an iron bracket, to the other side of which the fixed grinding plate is attached; *d d d d*, are the

the iron pins already described ; *q* is a round collar in the center, through which the common axle passes; and *r* is a tube by which it is supplied with oil, which is poured in at the hole *s*, fig. 3 ; *ttt* and *uuu* are screws which fix the grinding plate to the bracket, and at the same time adjust the former so as to make it truly vertical; *v* is a lip to prevent the grain, while passing to the grinding plates, from being forced behind them.

Fig. 7, is a section of the mill, passing between the two grinding plates and showing the fixed one in its proper position, (it is scored or channelled nearly in the same manner as common grinding stones,) *n* is a passage by which the grain passes from the feeder to the grinding plates, *x* and *y* fig. 2, show the bracket and fixed grinding plate in their relation to the other parts of the mill.

*z z*, Fig. 3, Two horizontal pillars which pass through the back of the wooden case in which the mill is contained, and are kept firm in their places by the screw nuts A A, they also pass though the hexagonal screw nuts B B, and thus keep the fixed grinding plate and its bracket firm in their places.

In front of the mill is a strong cross bar, which supports one end of the common axle in the collar C, figs. 2 and 3, and secures the ends of the horizontal pillars *z z* by the screw nuts D D, which are represented on a larger scale, fig. 8.

The running grinding plate E, figs. 1, 2, 3, is fixed on the common axle by means of two nuts. Both grinding plates are channelled on their surfaces, as represented, fig. 7, and being somewhat concave, (as shewn in the section, fig. 2,) the grain becomes continually more and more comminuted as it passes from the center to the circumference of the plates, whence it falls through the slit F, into the sack suspended beneath.

The

The distance between the two grinding plates is determined by the regulator G, represented on a larger scale, fig. 9. It consists of a collar *a*, which slides backwards and forwards on the common axle; but is prevented, by two projecting ribs working in two grooves, from having any concentric motion. That part of the surface of the collar adjacent to the screw nut *b*, is indented like a ratchet wheel, in order to receive the click *c*. Hence the mode of its section is obvious. In proportion as the nut is screwed, so as to make the collar press against the cross bar, the running plate is brought nearer to, and at length into actual contact with the fixed one, while the contrary takes place by screwing the regulator in the opposite direction.

Fig. 10, shews the screw ring, which may be seen in its place, fig. 1, Pl. 15. Fig. 11, is the key for detaching the parts of the machine and putting them together again.

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*The* SILVER MEDAL *and* FIFTEEN GUINEAS *were this Session voted to Mr.* W. AUST, *of Gray's-Inn-road, for a Machine for freeing the Shaft Horse, when fallen with a loaded Cart. The following Communications were received from him on the subject, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

I REQUEST that you will present to the Society for the Encouragement of Arts, Manufactures, and Commerce, a machine lately invented by me for raising loaded carts, drays, and any two-wheeled carriage, in the event of the shaft-horse falling.

Pl. 17.

falling. The first machine was tried at Messrs. Calverts and Co. Upper Thames-street, in the presence of Matthew Wood, Esq. Lord Mayor of London, John Foster, Esq. of the firm of Messrs. Calverts and Co., and several other Gentlemen, on Monday, the 30th of December, 1816: the above Gentlemen were fully satisfied, as the machine raised up a dray, with three butts of beer, in an instant. The Right Honourable the Lord Mayor gave an order for several of them to be placed about the different districts of the City for the accommodation of the public. The above machine is calculated to raise any two-wheeled carriage, in case of the shaft horse falling in any situation that it may, with ever so heavy a load. The machine is not very heavy, the weight 22lb. and is made conveniently to fix upon the shafts of the two-wheeled carriage, so that there is no difficulty in its being immediately applied by the drayman.

I am, Sir,
Your obedient Servant,

W. AUST.

*Gray's-Inn-road, February 5,* 1817.

To A. Aikin, Esq. Sec.

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*Reference to the Engraving of Mr.* W. Aust's *Machine for freeing the Shaft Horse when fallen, Plate* 17.

The instrument consists of the simple addition to the common props of the cart, of an iron bar and hook about half their length, attached to the top of each prop, and a bent iron prong at the bottom to prevent their slipping; the props are strengthened with an iron ferrule at each end; one of the props and hook-bar is shown on the foreground.

When

When a horse falls, the props are taken from their usual fastenings, and placed as in the engraving, with the hooks attached to the shaft ends; the fore-horse chains are then hooked in the loops at the top of the props, and as they stick in the ground when he pulls, he raises them perpendicular, and they pull the shafts up after them; the horse's power on the props increases as they become more upright, which is essential, as it gives the best help to the fallen horse when he is about to rise. On the second cart are shown the props slung to the shafts, the hooks remaining in the same rings of the shafts in which they would be put for action, and the props support the shafts on their own top as though the bars and hooks were not there, so that there is no inconvenience; the bars are not in the way, and their addition is not perceptible.

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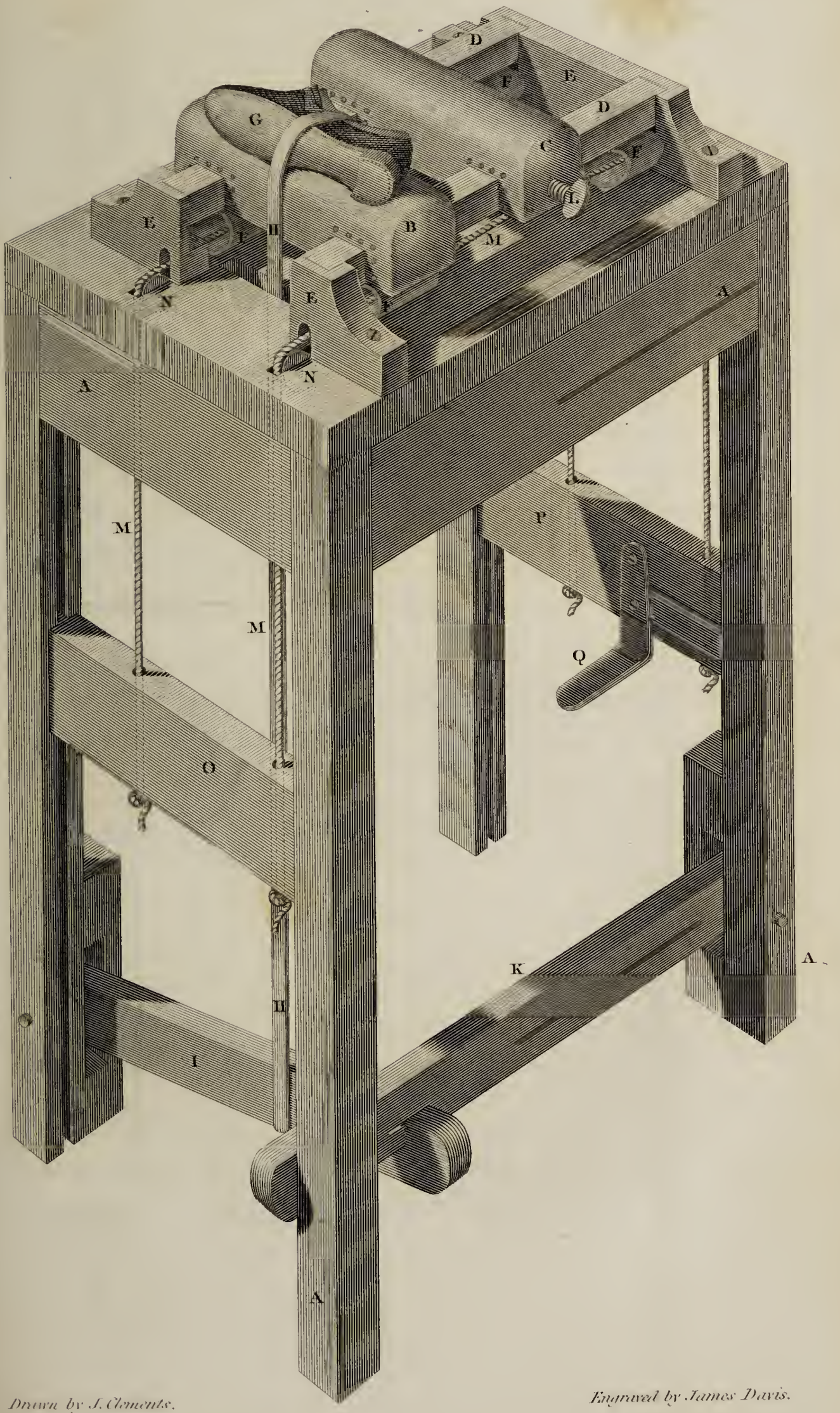
TEN GUINEAS *were this Session voted to Mr.* F. COAD, *for a Machine to enable Shoemakers to work standing. The following Communications on the subject were received from him, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

I REQUEST that you will lay before the Society for the Encouragement of Arts, Manufactures and Commerce, the accompanying machine intended to enable shoemakers to perform their work standing.

Having myself experienced the inconveniences of the posture which we are by the nature of our work compelled to adopt

# Mr. F. Coads's Shoe-making Machine. Pl. 18.




Drawn by J. Clements.

Engraved by James Davis.

adopt if we sit to it, and being desirous of changing as little as possible the method of holding our work, which from long experience has been found to possess many advantages, I have constructed a machine, the leading principle of which is to imitate as far as possible by means of moveable blocks the support afforded by the knees and thighs in the ordinary way of working.

Having proved the efficacy of this machine by a fair trial of some months, I take the liberty of offering it to the patronage of the Society; and remain,

Sir,

Your obedient Servant,

FRANCIS COAD.

*No. 8, White Horse-yard, April 25, 1817.*

---

*Reference to the Engraving of Mr.* F. Coad's *Machine to enable Shoemakers to work standing.*

The machine is shown in perspective, Plate 18. AAAA is a wooden frame or bench, two feet eight inches high, and two feet long; B C represent two artificial thighs or blocks, made of wood and covered with leather, which are supported by two rails D D; these rails are not fixed at the ends, but are at liberty to move up and down in the brackets EEE, under which are four rings F F F F, made of stiff leather, acting as springs to prevent any noise or shaking that may be made by beating the leather, &c.; G, a shoe and last held tight to the block B, by the foot-thong or strap H, which goes over the shoe and under the treadle I, and thus can be pressed down by placing the foot on the treadle K. The block B is fixed

to the rails D D, but the block C is made to slide on the rails, or may be fixed by the screw L in any place required. To the under side of the block C are fixed two cords M M, passing through the leather springs and over the pulleys N N, and fixed to the block O; the other ends of the cords are conducted over the pulleys in a similar manner and fixed to the block P; those blocks are made to slide up and down guided by the grooves in the ends of the frame. To the inner side of these blocks are fixed brackets or treadles Q R. If the treadle Q be pressed down by the foot, it will pull the thigh or block C to the end of the rails, but if the treadle at R, which cannot be seen in this view, be pressed down, the block C will be pulled close to the block B, and thus the shoe may be held in any position required.

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*The* SILVER MEDAL *was this Session voted to Mr.* WILLIAM CASLON, *of Salisbury-square, Fleet-street, for an improved Gas-Lamp. The following Communication was received from him on the subject, and a Model of the Lamp is preserved in the Society's Repository.*

SIR,

I send herewith an improved gas lamp, which I will thank you to lay before the Society, and I trust it will meet with their approbation.

I am, Sir,

Your humble Servant,

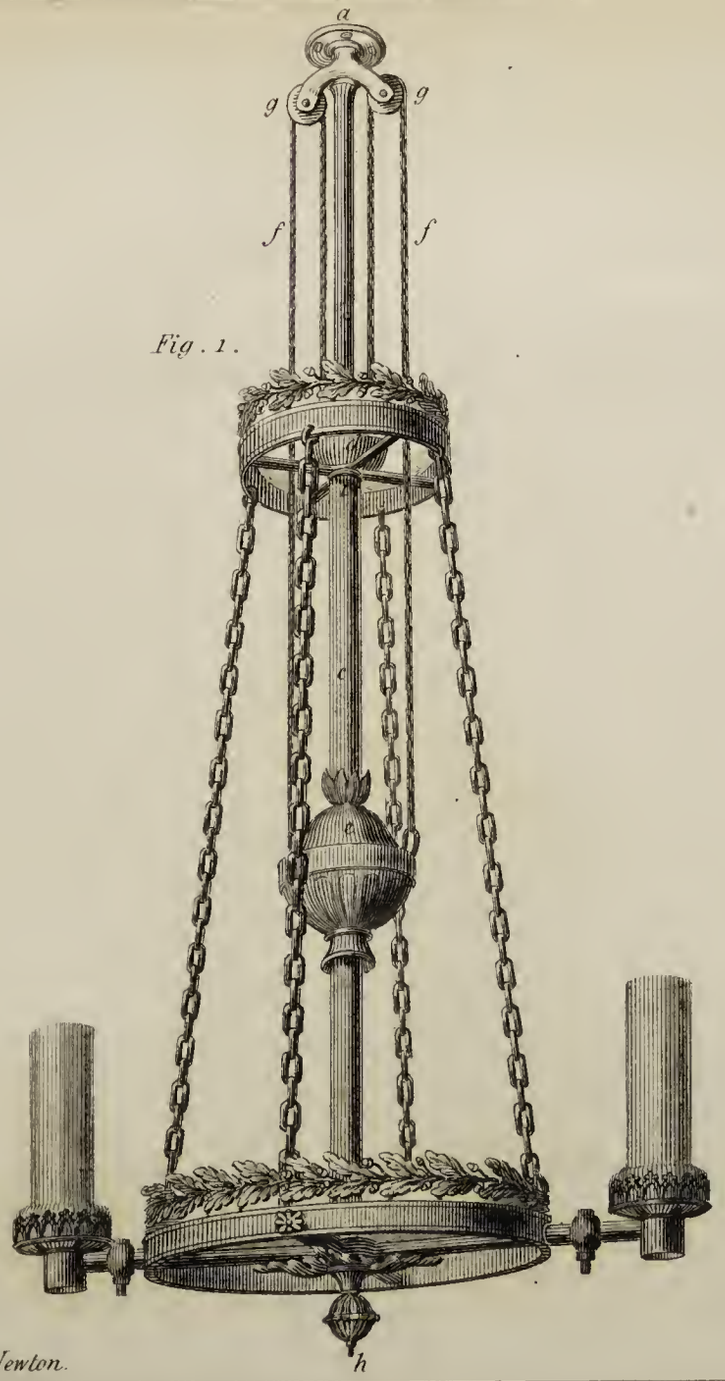
WILLIAM CASLON.

*Salisbury Square, Fleet-street, March 20, 1817.*

To A. AIKIN, Esq. Sec.

*Reference*

Fig. 1.




Drawn by W Newton.

Fig. 3.

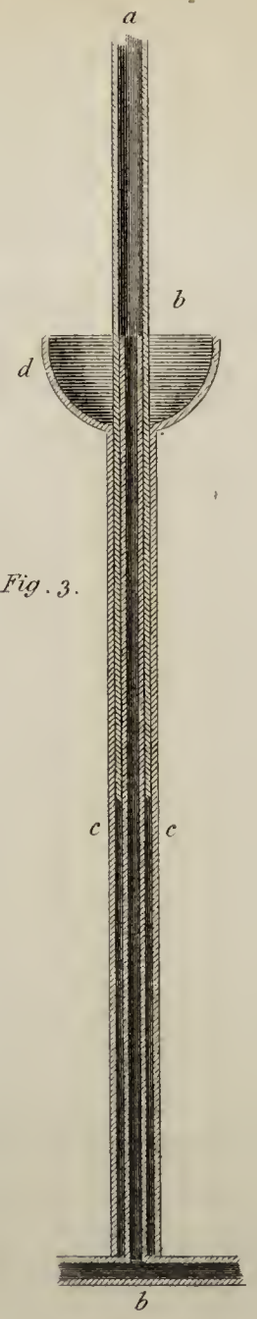
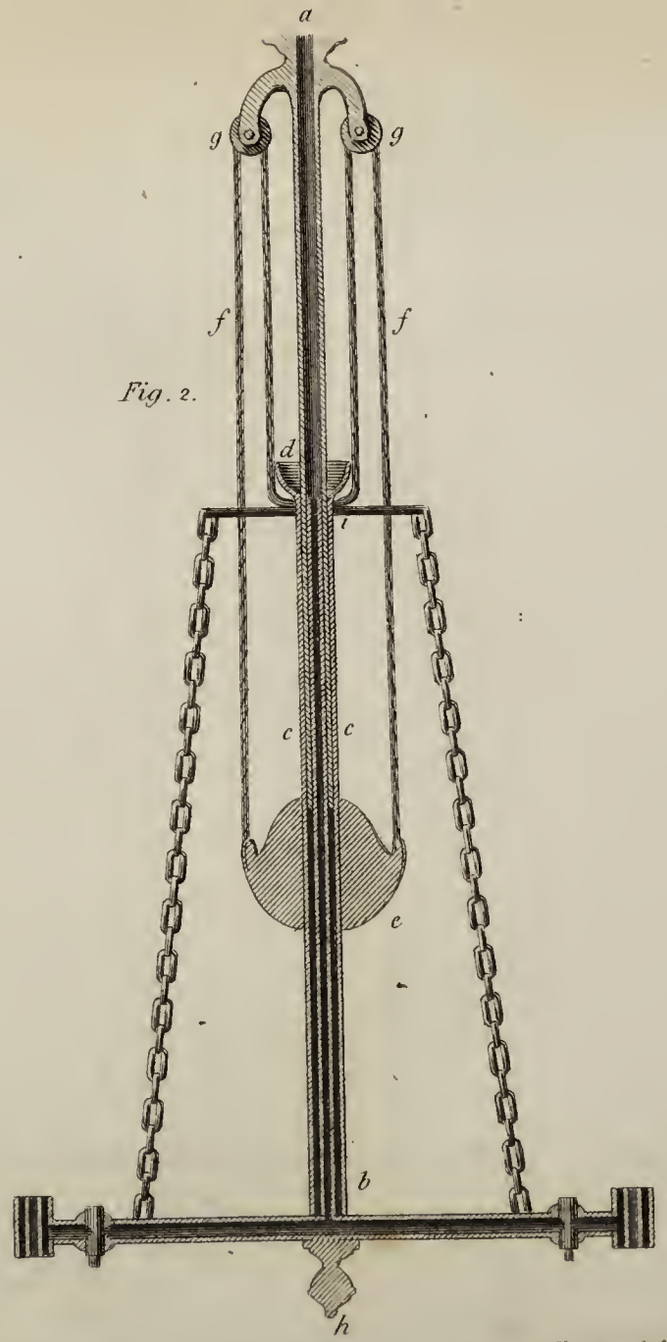



Fig. 2.




Engraved A.W Warren

Mr. W. CASLON'S, GAS LAMP.

*Reference to the Engraving of Mr.* W. CASLON'S *Gas Lamp.*

PLATE 19, fig. 1, a view of the lamp.

Fig. 2, a section of the same.

Fig. 3, a section on a larger scale of the gas pipe.

*a*, The middle pipe.

*b b*, The inner pipe, opening at its upper extremity into *a*, and at its lower extremity into the lateral pipe which supplies the two lamps.

*c c*, The exterior pipe, closed at the bottom, and expanding at the top into a cup *d*.

*e*, The balance-weight, supported by the cords *f f*, which pass over the pulleys *g g*.

In order to fit the lamp for use, take hold of the knob *h*, and push the lamp up as high as the balance-weight *e* will permit; then pour water into the cup *d*, till the exterior pipe *c* is quite full, and the water rises half way up the sides of the cup. Under these circumstances, it is obvious that the gas coming in by the pipe *a* will be prevented by the interposed water from escaping between the inner and middle pipes, and will pass through the pipe *b* into the lateral pipe which supplies the lamps.

The gas-pipe *c* passing loosely through the balance-weight *e* and the collar *i*, allows of a free rotatory motion in the lamp; and the water-joint produced by the three pipes allows the lamp to be raised or depressed nearly to the extent of the length of the pipe *c*.

*The* GOLD CERES MEDAL *was this Session voted to Mr.* C. ESSEX, *of East Acton, Middlesex, for a Machine for cleaning Corn. The following Communications were received from him, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

I BEG you would be pleased to submit, for the inspection of the Society for the Encouragement of Arts, Manufactures and Commerce, a model of an improved machine for cleaning corn, of my invention. It is peculiarly adapted to use under a thrashing machine, as by one process, with the same power necessary for the thrashing machine, it compleatly cleans the corn and renders it fit for market; at the same time dividing the different substances into the several compartments, with the power (by altering the sieves) of making two sorts of corn (by cleaning both,) or, in other words, by taking away as much of the small corn or tailing, as may be required, thereby rendering a sample superior in quality.

Having used the machine nearly eighteen months, I beg to remark, that from its peculiar power of dividing the dust from the chaff, I find the latter much more nutritious for cattle; and the superior mode of clearing the rubbish, that the corn may fall to the wind alone, renders it much more susceptible of the quick succession of friction, which compleatly eradicates every particle of mould, and, in a degree, has the effect of drying and improving the sample; and which, as in the last wet season, renders it peculiarly useful;

ful; added to these, are many other advantages which will suggest themselves to those acquainted with the necessity of such convenience and expedition in agricultural pursuits.

In the hope that the machine will be honoured by the approbation of the Society, and be generally useful,

I have the honour to be,
Your most obedient humble Servant,

C. ESSEX.

*East Acton, Feb.* 17, 1817.

To A. AIKIN, Esq. SEC.

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CERTIFICATES.

SIR,

HAVING seen your newly-invented machine work, I with pleasure give it my entire approbation, and sincerely congratulate you on your success. It is far superior to any I have ever seen, inasmuch as it saves much trouble and expence in the necessary division of racquet, chaff dust, hulks and corn, which it divides in a very compleat manner, rendering the corn perfectly clean and fit for market. I think that the division of the dust and small seed weeds from the chaff a great improvement, as, when the chaff is carried into the stable, the carter generally sifts the seed weeds in the dung, which of course is carried again to the field.

I remain, Sir,
Your most obedient Servant,

ROBERT BAGSHAW.

*East Acton, February* 17, 1817.

To C. ESSEX, Esq.

My Dear Sir,

I was much pleased the other day by the inspection of your machine, and I most sincerely congratulate you on your having brought it to such perfection. It certainly is by far the most compleat in every respect, and does its work in a much superior way to any I have ever seen.

I am, my Dear Sir,

Your's very truly,

William Delamain.

*Berners-street, February* 17, 1817.

Mr. C. Essex.

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Sir,

I have carefully examined the machine which you have invented for clearing corn, and I approve of it entirely for these reasons: First, it separates the chaff and rubbish from the corn at once, so that the latter is quite clean and fit for market immediately, which, for several reasons, must be of great advantage to the farmer. Secondly, the chaff is separated also from the dust, and therefore is better for cattle. Thirdly, the seeds of weeds being also, with the dust, thrown apart from the chaff, can be destroyed, so as not to go to the dunghill and be carried to the field again. Fourthly, the corn passing so rapidly through the several sieves must be much dried and cleared from mould;—a great benefit, in my opinion as a mealman, especially in seasons like the present. And, fifthly, to these advantages I may add, that *all* is effected by one and the same,

and

and no greater power than that which at the same time puts the thrashing machine in motion.

I am, Sir,
Your obedient Servant,
J. Adams.

*Acton Mill, February* 18, 1817.

To Mr. C. Essex.

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Dear Sir,

In answer to your's of Tuesday last, requesting my opinion of your newly-invented cleaning machine, I have great pleasure in stating that, to my judgment, it fully answers the purposes intended, particularly that of cleaning the corn, and at the same time compleatly separating the chaff from the dust, which, of course, renders it in a much better state for cattle. I must at the same time observe, that I consider it a great acquisition attached to the thrashing machine, in compleating the whole of the business, which before was not more than half done, and that in great confusion.

I remain, Dear Sir,
Your's very truly,
C. Frisby.

*Acton, February* 19, 1817.

To C, Essex, Esq.

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Dear Sir,

I beg leave to express my entire approbation of your newly-invented machine, which I saw at work the other

day. In my opinion it claims the superiority over every other machine I ever met with, by the facility with which it clears away the different substances, such as racquet, hulk, and chaff, and stops the dust; by these means the corn is presented to the wind in the same state as when it has passed twice through other machines, and is by one process cleaned and rendered fit for the market. It has also the power of making two samples, which, by altering the sieves both at the same time, and preventing the dust from being blown with the chaff, renders the latter more nutritious for horses; and the small seeds remaining with the dust, prevents them from being carried into the field again. I beg to remark, that by the quick succession of friction the grain undergoes, it not only rubs off any dust or mould, but dries it and renders the sample much brighter; besides, the advantages must be great, arising from the convenience, expedition, &c. by which every part of the process is attended.

I am, Dear Sir,

Your's truly,

ROBERT TURES.

*Harlesden Green, Willsden, February 19, 1817.*

To Mr. C. ESSEX.

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DEAR SIR,

HAVING been present at the working of your improved cleaning machine, I have much pleasure in saying, that I am perfectly satisfied as to the compleat manner in which it delivers the corn at once clean and fit for market; also, that great

# Mr C. Esex's Winnowing Machine.

Fig. 1.

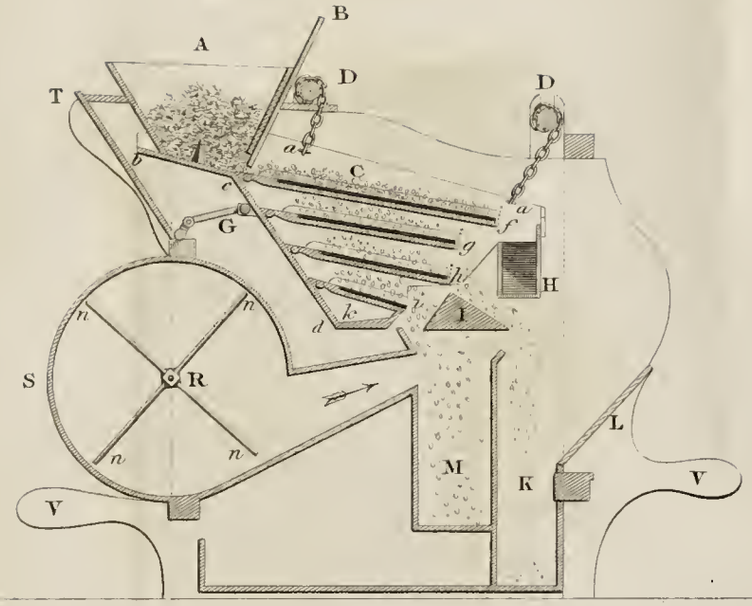



Fig. 2.

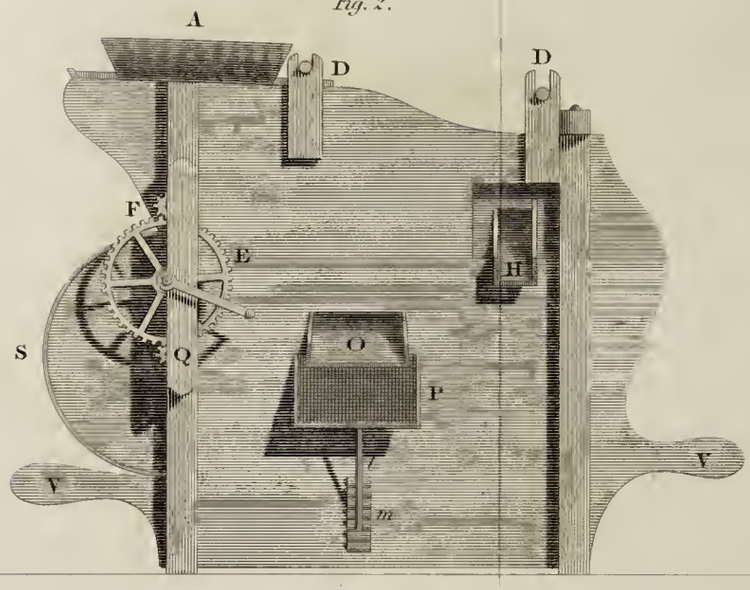



Fig. 4.

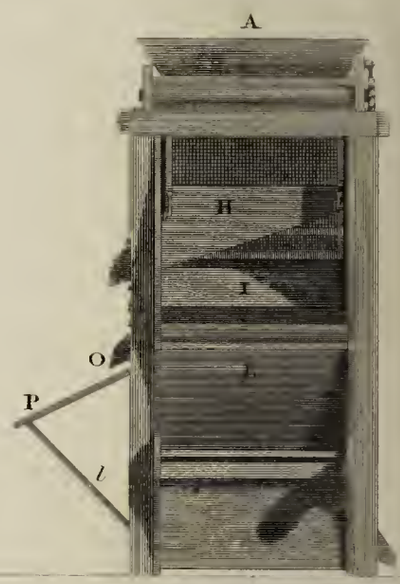



Fig. 6.

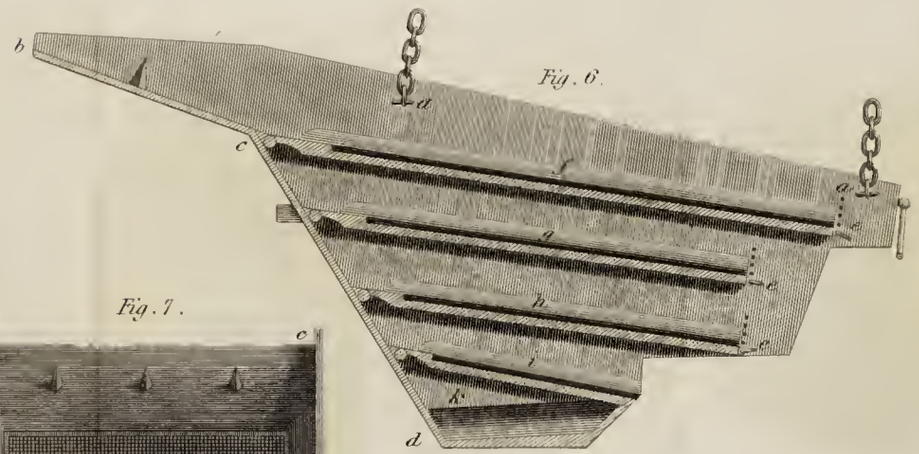



Fig. 7.

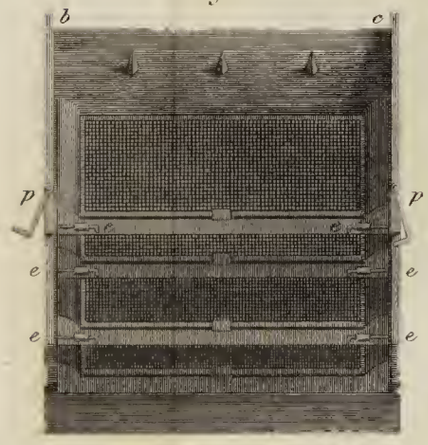



Fig. 8.

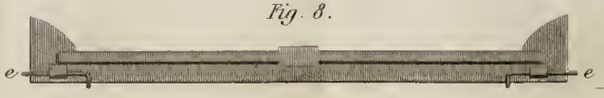



Fig. 5.

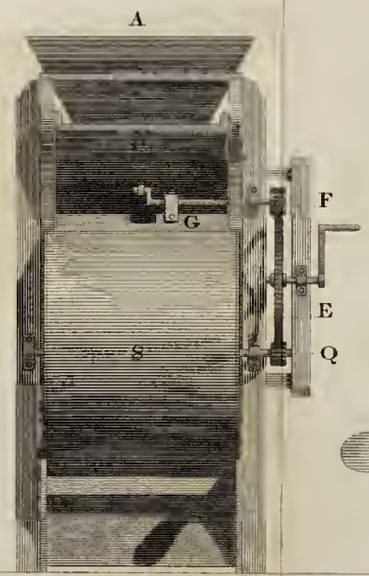
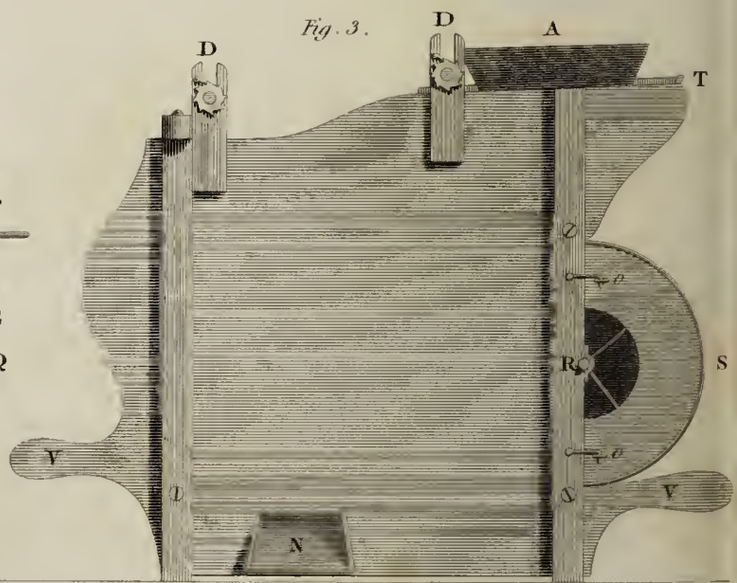



Fig. 3.




Drawn by W. Newton.

Engraved by S. Porter.

great merit is due, as it separates the chaff from dust and seeds of weeds, which certainly is a great acquisition.

I am, Dear Sir,

Your obedient Servant,

THOMAS YOUNG.

*East Acton, February 20, 1817.*

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## *Reference to the Engraving of Mr.* ESSEX's *Winnowing Machine, Plate 20.*

A A, figs. 1, 2, 3, 4, 5, the hopper into which the corn is poured, as it comes from the thrashing mill.

B, fig. 1, a sliding board by which the size of the aperture, through which the contents of the hopper are discharged, is regulated.

C, fig. 1, the sieve-box in its place, of which fig. 6 is a section, and fig. 7 a front view.

The sieve-box is suspended by four chains, two on each side *a a*; these are attached to rollers with ratchet wheels D D, figs. 1, 2, 3, by means of which the chains may be lengthened or shortened at pleasure, and consequently a greater or less slope may be given to the sieve-box and its contents.

E, figs. 2 and 5, a cog-wheel turned by means of a handle, and working into two pinions, one at top and one at bottom; of these, the former F, figs. 2, 5, has its axis lengthened into a crank G, figs. 1, 5, by means of which a reciprocating motion is communicated to the sieve-box.

*b c*, figs. 1, 6, 7, the wing of the sieve-box, consisting of a sloping

a sloping board, which forms the bottom of the hopper, and into which are inserted three pegs, in order to prevent the racquet from collecting in the hopper.

*c d*, figs. 1, 6, the back of the sieve-box, to which are attached the hinges of the sieves.

*e e*, figs. 6, 7, bolts by which the sieves are supported in front, by being pushed into holes in the sides of the sieve-box; to each sieve are four or five pairs of holes, which thus admit of considerable variety in the degree of its slope. Fig. 8 shews the front of a sieve, with the bolts on a large scale.

*f*, figs. 1. 6, the upper sieve made of split willow wands, by which the racquet is separated from the corn and other substances. The corn, &c. falls through the meshes of the sieve, and the racquet sliding over the front is received in the wooden spout H, figs. 1, 2, 4, which conveys it out of the machine.

*g*, figs. 1, 6, the second sieve, of wire, which detains the chaff and hulks, and allows the dust, small weed-seeds, and corn to pass through; the hulks and chaff fall over the front of the sieve upon the inclined plane, I, figs. 1, 4, and thence into the receptacle K, fig. 1; and, as they are falling, are exposed to the blast from the fan, by which they are cleaned from the dust and thus rendered better food for horses: the contents of this receptacle are taken out by drawing the sliding board L, figs. 1, 4.

*h*, figs. 1, 6, a wire sieve (the 3d), the meshes of which are closer than the preceding, in order to detain such hulks as pass through the former. These fall over the front of this sieve upon the inclined plane just mentioned, and so into the receptacle K, fig. 1.

The lowest sieve *i*, fig. 1, 6, has it meshes so close, as only to allow the dust together with the weed-seeds and small

corn

corn to pass through; the full grown corn rolls along its surface, and falls over in front upon an inclined plane, by which the grains are dispersed and thus are exposed to the blast from the fan, which carries off the light impurities. The corn being now thoroughly cleaned, falls into the box M, fig. 1, where it remains free from dust.

The dust, &c. that passes through the lower sieve, falls into the receptacle *k*, fig. 1, 6, and is discharged from the machine by the spout O, fig. 2, 4; it then falls on the sieve or screen P, fig 2, 4, which by means of the foot *l*, and the notches *m*, may be set to any required slope, and thus will separate the small corn from the dust and weed seeds.

The cog-wheel E, fig. 5, already described, turns the pinion Q, the axis of which prolonged, forms the spindle R, fig. 1, 3, to which the fliers *n n n n*, fig. 1, of the fan are attached.

S, fig. 1, 2, 3, 5, the cover or hood of the fan, fastened by hooks and staples *o o*, fig. 3, and therefore capable of being removed at pleasure.

T, fig. 1, 3, a sliding board, allowing access to the crank for the purpose of greasing or repairing it.

*p p*, fig. 7, hooks by which the racquet spout is suspended below the sieve *f*.

V V, figs. 1, 2, 3, handles of the machine.

*The* SILVER MEDAL *was this Session voted to Mr.* GABRIEL BRAY, *of Charmouth, Dorsetshire, for a Life Boat. The following Communications were received from him, and a Model of the Boat is preserved in the Society's Repository.*

SIR,

I BEG leave to send you herewith, for the inspection of the Society for the Encouragement of Arts, &c. a model of a Life Boat, which I have constructed.

The advantages which I propose to obtain by the particular construction which I now submit to the Society, consist in the peculiar simplicity of the plan, and the universality of its application.

Its simplicity is conspicuous in the circumstance of its being applicable to all boats, without the introduction of any incumbrance or inconvenient fitting up, and its extensive utility appears to be sufficiently evident, from its being applicable to all boats of whatever form or dimensions; and by its affording the opportunity of bringing into operation, without any attendant inconvenience, a very great body of confined air, the superior buoyancy of which is well known, one cubic foot of air being capable of supporting 56lbs.

But as I conceive that the model will best shew the nature and quality of the invention, I shall only add a few practical observations respecting the mode of applying it.

1st. *As to measuring boats for the Air-boxes:*

Measure under the thwarts of the boat intended to be fitted with air-boxes, for the tops of the boxes, as at A A, in figure 1, Plate 21, then let fall a perpendicular line from the thwart,

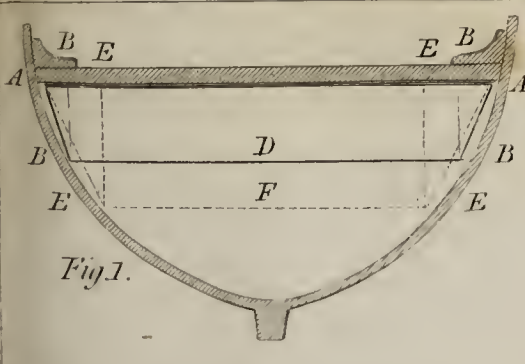



Fig. 1.

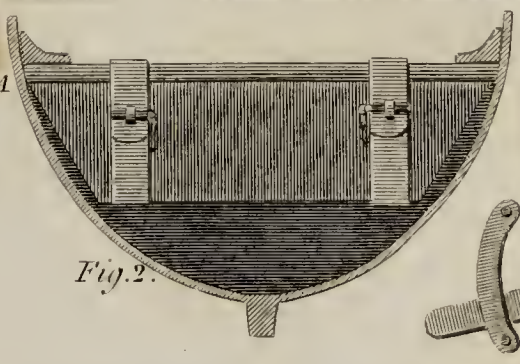



Fig. 2.

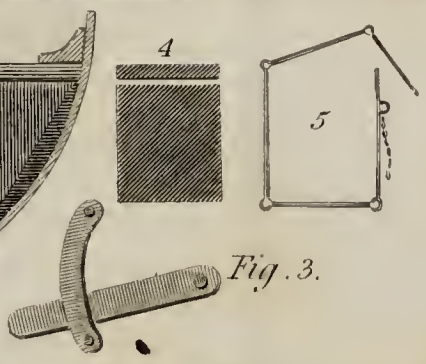



Fig. 3.

Drawn by Cornelius Varley

Engraved by A.W. Warren

# Capt.n Brays Life Boat.

thwart, observing where it touches the boat's bilge inside, as at B B; this will give the exact angle for each end of the box, for that thwart. Next measure horizontally across, for the length of the bottom of the box, as from B D, to B, allowing an inch spare in the top and bottom, that the box may be put in its place with ease.

2dly. *As to preparing the Air-boxes.*

For making and fitting the air-boxes, I would recommend clean deal plank, free from knots, or rents, of one inch thickness; great care should be taken in planing them, to make those parts that are to be nailed together very exact and true. Make a composition of one-eighth part rosin, and seven eighth parts of pitch, well mixed together by boiling, then, beginning with the bottom sides and ends, pay well with the hot composition all the parts that are to be nailed together, dipping every nail in the composition before it is driven. Pay also all the inside of the box well with the same composition, and likewise the upper edges of the sides and the ends, and then nail on the top, first dipping every nail in the composition. Let there be a small bung-hole in the top of the box, about the size of the mouth of a common bottle, for the purpose of affording an opportunity to ascertain, by blowing into the bung-hole, whether the box is completely air tight; and if not, where the defect is. The bung-hole, when the box is fitted in the boat, will be always close up under the thwarts, but still to prevent the starting of the bung, which might be attended with fatal consequences, I would recommend, that two pieces of sheet copper, of the shape described in figure 3, should be fixed on with short screws, the straight piece of copper to be fixed by a screw at one end only, to traverse under the semi-circular piece,

which

which is fixed by screws at both ends, so as to cover the bung, and confine it down securely. For the better preservation of the air-boxes, they should be well painted outside, and to denote their proper place in the boat, they should be numbered 1, 2, 3, 4, &c. to shew the thwarts to which they belong.

3rdly. *As to fixing the Air-boxes in the Thwarts.*

I would recommend that the clasps should be made of stout sheet copper three inches wide, with four hinges, one at each angle of the bottom of the box and the others at the angles or edges of the thwart to which they belong; going over the thwart, and having an eye and a pin to fasten it. The pin should be secured by a small chain, six inches long. It will be necessary to have two clasps to each box, as described in figure 2, and the clasps should likewise be numbered to denote to which boxes they respectively belong.

Fig. 4, represents the end of the air-box, and the end or breadth of the thwart.

Fig. 5, represents the shape and make of the copper clasp, and its four hinges; one at each corner or angle. I place the pins for fastening the clasps in the after part of them, for this reason, that as the sailors sit with their faces towards the stern, they will thereby have a better opportunity of discovering whether any of the pins get loose.

The long air-boxes are to be lashed one over each side of the boat, just low enough to admit a free use of the oars, with their angular ends forward, and are meant to be used when a vessel is obliged to be quitted at sea, either by the accident of fire, or starting a but-end of a plank.

I remain, Sir,

Your very humble Servant,

GABRIEL BRAY.

*Charmouth, Dorset, February 17, 1817.*

To A. AIKIN, Esq. Sec.

*Reference*

# Mr. G. Preston's portable Deck Glass, & Ventilator

Fig. 1.

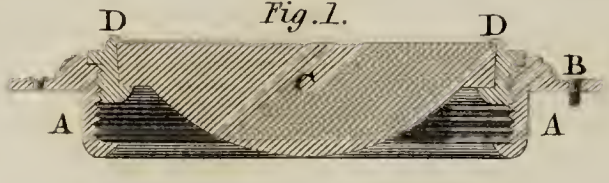



Fig. 3.

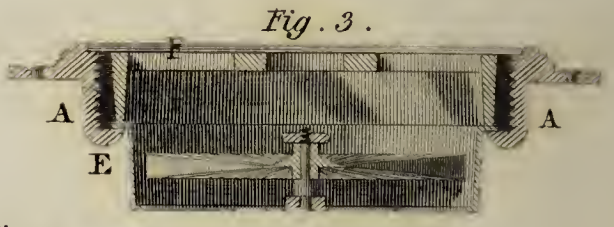



Fig. 2.

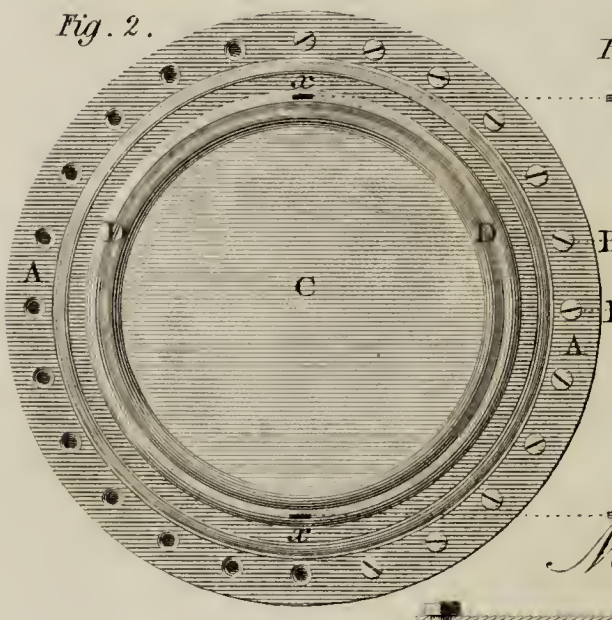
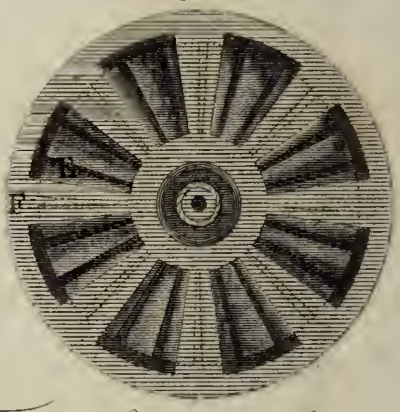



Fig. 5.

Fig. 4.




# Mr. Farnham's Steam Trap.

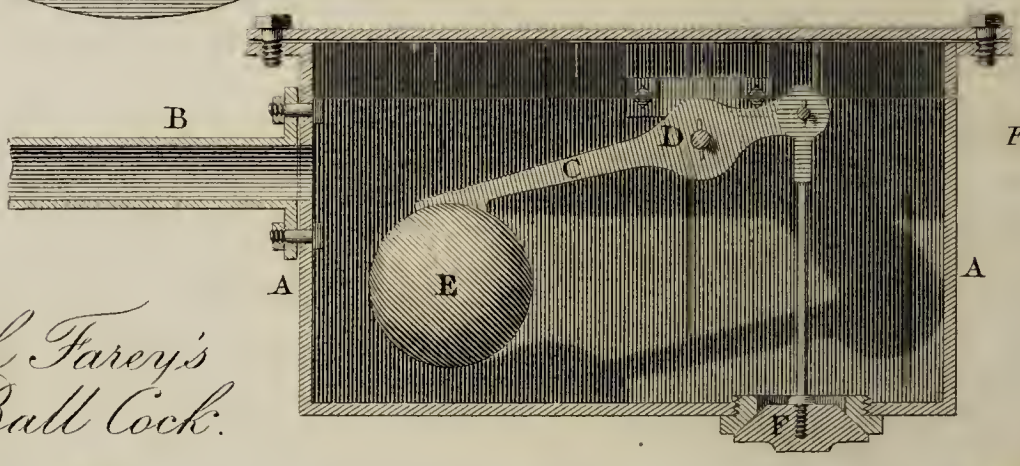



Fig. 6.

# Mr. Joseph Farey's Double Ball Cock.

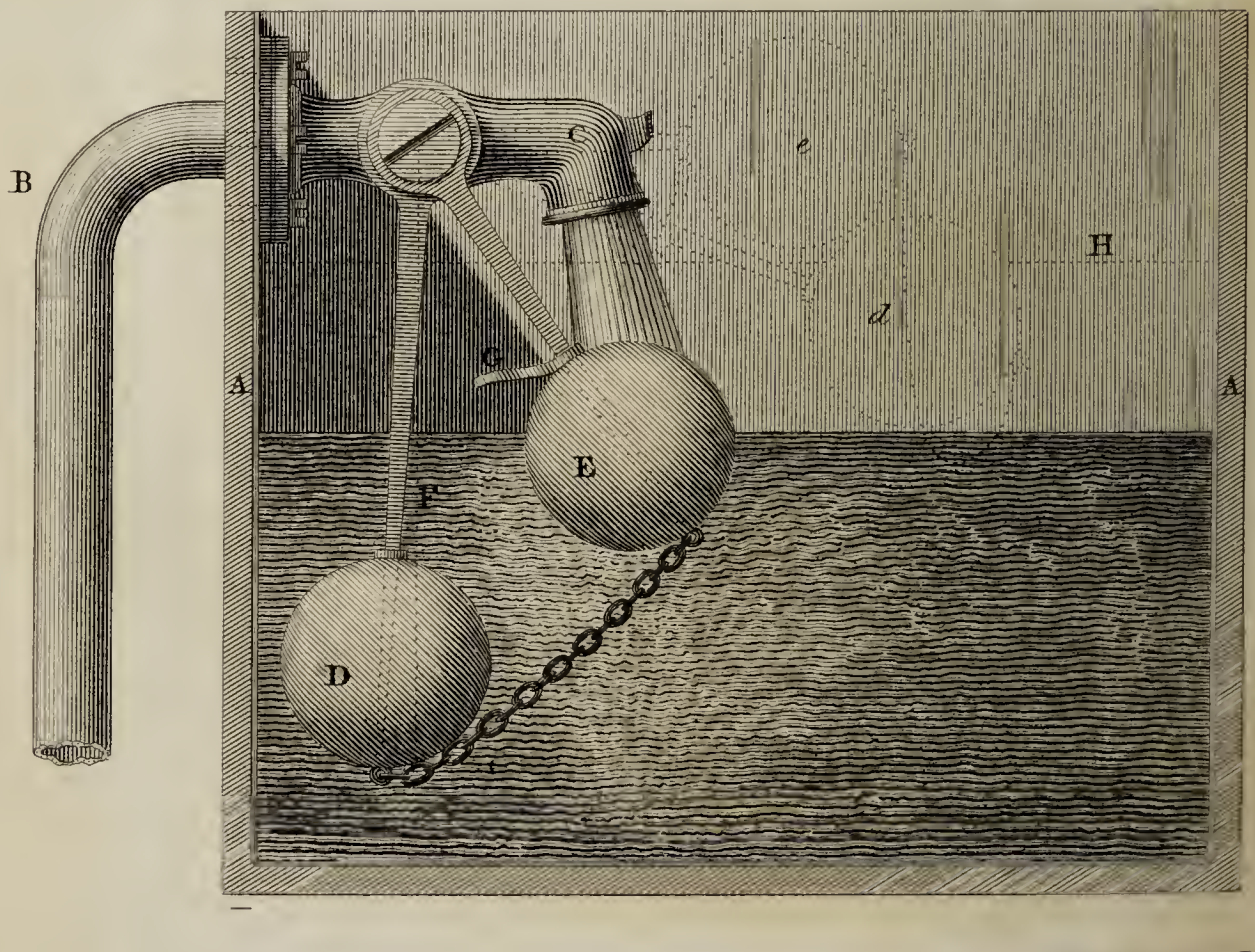



Fig.

Drawn by J. Clement.

Engraved by S. Porter.

*Reference to the Engraving of Mr.* GABRIEL BRAY'S *Life Boat, Plate* 21.

FIG. 1. a transverse section of a boat, shewing the method of measuring it for the air-boxes attached under the thwarts.

Fig. 2, shews an air-box fixed under one of the thwarts.

Fig. 3, the method of securing the bung of the air-box.

Fig. 4, an end view of a thwart, with the air-box beneath it.

Fig. 5. an end view of one of the copper clasps, by which the air-box is fixed in its place.

The foreground shews a boat with the external and internal air-boxes attached. In the distance are represented two boats fitted up according to Captain Bray's plan, labouring in the surf.

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*The* SILVER ISIS MEDAL *was this Session voted to Mr.* JOSEPH FAREY, *of Howland-street, Fitzroy square, for a Double Ball-Cock. The following Communication was received from him, and one of the Cocks is preserved in the Society's Repository.*

GENTLEMEN,

HAVING considered the several imperfections in the common ball-cock, as applied to water cisterns. I was induced to make some alterations which possess the following properties—first, that the cock will run with its full bore till the cistern is filled to the intended level, and then shuts itself instantly, thereby a great saving of time would be effected,

fected, if the cisterns were fitted with my improvement to the common ball-cocks, since it requires more time to fill the last foot in height of the cistern, than the improved one demands to fill it entirely; and in situations where the water is not clear, and requires time to settle before it is fit for use, it becomes of consequence to fill the cistern as quick as possible, for the water cannot begin to settle till the cock has done running, which is a tedious time in the common ball-cock. Another property of this improvement is, that the cistern may be filled to any required level, by only lengthening or shortening the chain which connects the two balls together, for as the cock remains open till the secondary ball has risen by its buoyancy, so as to bring the chain to a state of tension, and then closes suddenly, the length of the chain determines the height to which the cistern will fill itself. I applied this improvement to a common ball-cock, above twelve months since, and found it to answer the purpose extremely well, possessing all the above mentioned properties, though made quite in a temporary way; it did not cost more than a few pence, being made with one of the stretchers of an umbrella, and a large bung, which were connected to the cock by a small brass chain. I have not found it to require any attention, always acting very perfectly except during the frost, which every cock must be subject to. Thinking this improvement might be of some service to the public, I have taken the means of making it known through the medium of your useful Society; and am,

Gentlemen,

With the greatest respect,

Your humble Servant,

JOSEPH FAREY.

*No. 57, Howland Street, Fitzroy Square, January* 15, 1817.

To A. Aikin, Esq. Sec. *Reference*

*Reference to the Engraving of Mr.* FAREY'S *Double Ball-Cock, Plate 22.*

A A, is a section of a cistern lined with lead; B is a pipe which communicates with the reservoir; C the cock; D the ball and lever which is fixed to the plug E, the ball and lever which is put on a cylindrical part of the plug, and is at liberty to turn on its axis without turning the plug; the two balls are connected together by a small chain. When the ball D is placed in this position, which is a little on the left hand of the perpendicular or dotted line F, as the water rises in the cistern, it tends to keep the cock open: the ball E is kept a little on the right hand of the dotted line F by the stop or staple G, and has consequently a tendency to raise the ball as high as the chain will permit, without altering the position of the lug or cock; but, as the water rises higher, the ball E pulls the ball D to the right hand side of the perpendicular F, and then the water immediately raises the ball D to the top of the water, and shuts the cock. The two balls D E will then be in the position as represented by the dotted lines *d e*, and the water will be at the dotted line H.

*The* SILVER ISIS MEDAL *or* FIVE GUINEAS, *was this Session voted to Mr.* W. FARNHAM, *of Feudal-street, Grange-Road, Bermondsey, for a Steam Trap. The following Communication was received from him on the subject, and a Model is preserved in the Society's Repository.*

SIR,

THE adoption of steam for the communication of heat having become general, I conceive that any contrivance to facilitate the construction of the necessary apparatus will now be considered useful.

A great and general inconvenience in steam apparatus is the accumulation of condensing steam in the lowest level of the steam-pipe; or, in other words, at the point of a vertical angle; the consequence of which is, that when this water is cold, as in the morning, on the arrival of fresh steam the sudden condensation thereof causes a violent concussion in the whole of the pipe, and makes considerable noise, and if there should be several such points, a considerable quantity of steam is condensed which might be applied to its intended purpose, and further, at the extremity of the pipe, if no preventive be adopted, the steam escapes as it is generated, and consequently a very great proportion of the heat is lost and misspent. The preventive generally adopted is a steam-trap or syphon, which contains water into which the steam enters, and becomes condensed as it arrives, which syphon must be of such a height as to contain a column of water capable of overcoming the pressure of the steam. This height being such as to require much room, its application is occasionally very inconvenient and sometimes impossible.

To

To remedy every inconvenience from want of room, to save expence, and to prevent the escape of the steam till its heat is rendered serviceable, I have invented a trap which I beg to lay before the Society for the Encouragement of Arts. Any explanation that may be required, I shall with pleasure communicate whenever the Society may desire.

I am, Sir,
Your obedient humble Servant,
WILLIAM FARNHAM.

*No. 3, Feudal Street, Bermondsey, March 20, 1817.*

To A. Aikin, Esq. Sec.

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## *Reference to the Engraving of Mr.* Farnham's *Steam-Trap, Plate 22.*

Fig. 6, A A, is a section of a square case or cistern, having a moveable cover on the upper part; B the steam-pipe; C a lever, moveable on a fulcrum at D, having the ball E at one end, and a conical valve F suspended at the other. As the steam is condensed, the water accumulates in the bottom of the cistern, which raises the ball, and at the same time presses down the valve, and lets the water run out; but, when the water is nearly all out, the ball descends and shuts the valve, and thus prevents the steam from making its escape.

*The* SILVER MEDAL *was this Session voted to Mr.* GRANT PRESTON, *of Burr-Street, Wapping, for a Portable Deck Glass, and Ventilator. The following Communications on the subject were received from him, and a Model of the Invention is preserved in the Society's Repository.*

SIR,

ENTERTAINING the highest opinion of the liberality of the *Society for the Encouragement of Arts, &c.* I have to request that you will lay this my communication respecting a portable *Deck Glass, with a Ventilator*, for the conveniency of giving air to ships' state-rooms, &c. before them. I am well aware, from the opportunity I have had of viewing different vessels in the habit of carrying passengers, of the necessity of having their small rooms made airy; and I have been induced to try my experiment, which, I am happy to add, has not been in vain. Indeed my deck glass, with a ventilator, has been much approved of by several of the East and West Indiamen which have them; also by the Leith smacks, &c. most of them being now furnished with those of my construction.

I am, Sir,

Your very humble Servant,

GRANT PRESTON.

*No. 58, Burr Street, April 16th*, 1817.

To A. AIKIN, Esq. SEC.

CER-

CERTIFICATES.

SIR,

You having made the first trial of your portable deck lights on board of the smack *Ocean*, then under the command of my late father, it therefore falls to my lot to repeat my opinion of their utility.

In the first place, I observe that they not only give as much light as the patent illuminator, but are more convenient in walking the vessel's deck, by not having the rise. But the chief utility in your's is, the conveniency of taking out in dry weather, with the apparatus for giving air, and putting them again in their place, the same as a fixture. I further observe, that after a variety of experiments having been tried at a considerable expence, your's is the most effectual I have ever seen for ventilating the state-rooms of the vessels in our trade, and have no doubt will be found very useful for ships going to warm countries.

Wishing you every success with them,

I am, Sir,

Your most obedient Servant,

ROBERT NESBIT.

*Leith and Berwick Wharf, London, 26th April,* 1817.

To Mr. GRANT PRESTON.

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SIR,

I CAN now assure you with much satisfaction, after so long a trial of your portable deck lights in the state rooms of the several smacks trading at this warf, that they are considered a very great improvement on the bulls' eyes

formerly used, as we find they give us equal light, with the addition of ventilation, and admission of fresh air when the weather permits, the want of which was the greatest complaint made by passengers against our new constructed cabins.

I am, Sir,

Your obedient Servant,

ANDREW LAURIE.

*Leith and Berwick Wharf, 29th April, 1817.*

To Mr. GRANT PRESTON.

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SIR,

I HAVE the pleasure to inform you, that your shifting deck light with a ventilator, is a most convenient article for a ship's stateroom; I have now tried it three voyages between London and Dundee, on board of the smack *Union*, and it exceeds my expectation, both in giving air, and in its security from water coming down. I have no doubt that the invention will be found very useful to ships in general, particularly to those going abroad.

I am Sir,

Your obedient Servant,

JOHN WISHART.

*Smack Union, Down's Wharf, London, 28th April, 1817.*

To Mr. GRANT PRESTON.

Other

Other testimonials in favour of Mr. Grant Preston's deck glass, &c. were received by the Society, but from the very satisfactory evidence contained in the foregoing certificates, it has not been deemed necessary to publish them.

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*Reference to the Engraving of Mr. G. Preston's portable deck glass and ventilator. Plate 22.*

Fig. 1, is a section, and fig. 2 a plan of the brass frame and the glass. Fig. 3 is a section, and fig. 4 a plan of the ventilator. The same letters of reference apply to the same parts in each figure. A, fig. 1, 2 and 3, is a brass frame which must be screwed down to the deck with the screws B B; C the glass set in a brass ring; D the ring having a screw cut on the external part, so that the glass may be screwed in or out of the frame at pleasure. E, fig. 3, is the ventilator resting on the bottom part of the frame, the glass being previously removed; F, a grate, set in the frame above the ventilator to prevent the people on deck from injuring the ventilator; F and E, fig. 4, are plans of the grate and of the ventilator. Fig. 5 is a flat bar of iron, the ends of which fit into the holes *x x*, fig. 2, for the purpose of unscrewing the glass C.

TEN GUINEAS *were this Session voted to Mr.* C. WILSON, *of Union-Street, Borough, for a Machine for Sweeping Chimnies. The following Communication was received from him on the subject, and one of the Machines is preserved in the Society's Repository.*

SIR,

I WILL thank you to lay before the Society for the Encouragement of Arts, Manufactures, and Commerce, a machine which I have recently invented for the purpose of sweeping chimnies. It has given compleat satisfaction in all the cases in which it has been applied, and I hope will supersede the necessity of employing climbing boys.

I remain, Sir,
Your obedient Servant,
C. WILSON.

*No. 25, Worcester-Street, Union-Street, Southwark, December 4th,* 1816.

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CERTIFICATE.

HAVING purchased of Mr. Wilson for 10*s.* 6*d.* his apparatus for sweeping chimnies, I put the same for trial into the hands of my people. We have now swept upwards of 30 chimnies with it in the neighbourhood of Blackfriars road, to the satisfaction of our employers. The machine works so easy, that my son, twelve years old, finds no difficulty in managing it alone.

Signed,
M. PALMER,
Chimney-sweeper, and dealer in soot.

*December 2nd,* 1816.

*Reference*

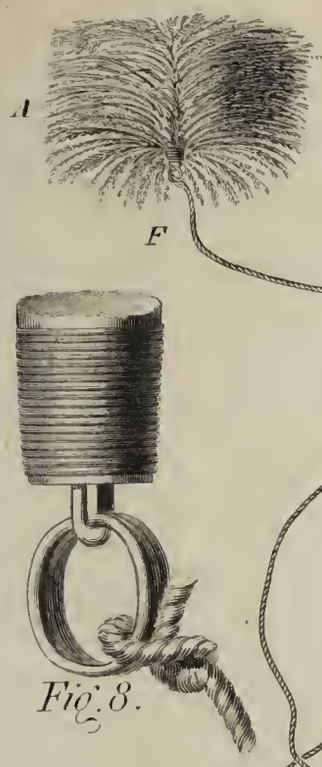



Fig. 8.

Fig. 5.

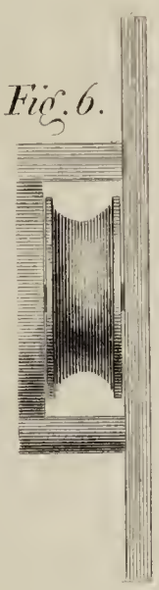


Fig. 6.

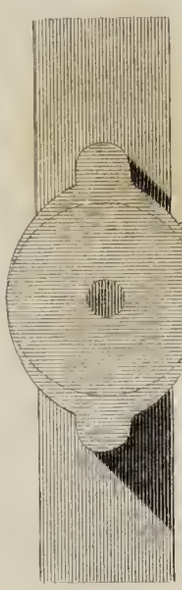


Fig. 7.

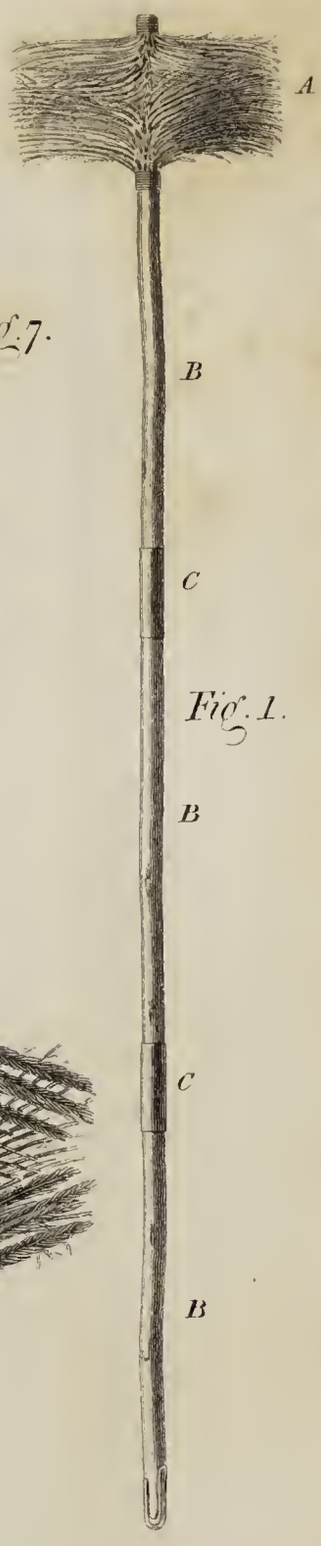



Fig. 1.

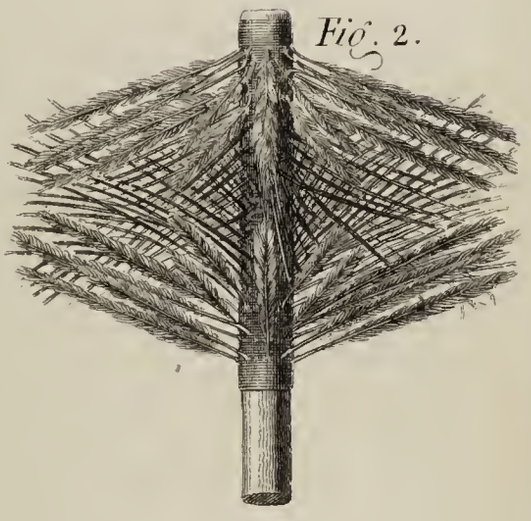


Fig. 2.

Fig. 4.

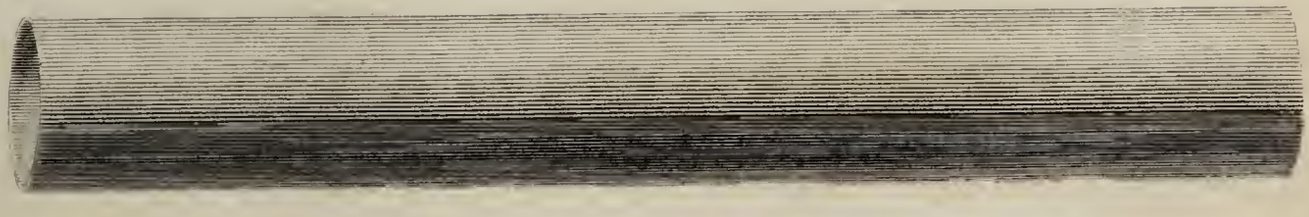


Fig. 3.

M.A. Nicholson Delin.

A.W. Warren Sculp

# Mr. Wilson's Machine for Sweeping Chimneys.

# Mode of securing the Arab's rudder; Communicated by Captn. Bugnold, R. N.



Fig. 1.

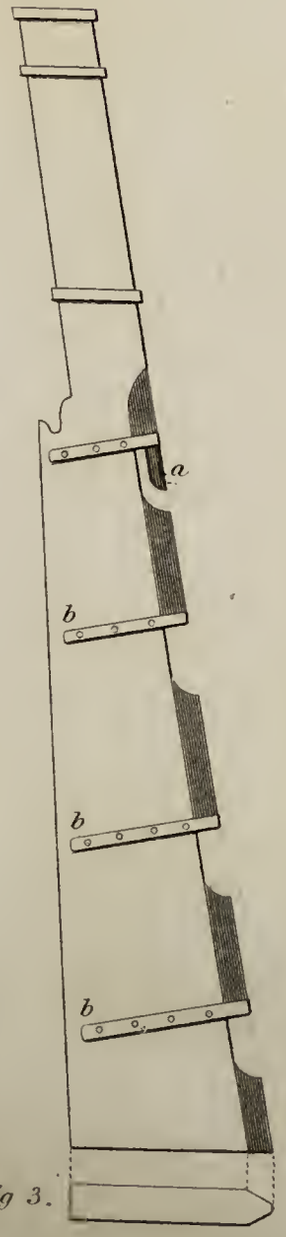



Fig 3.

Fig. 2.

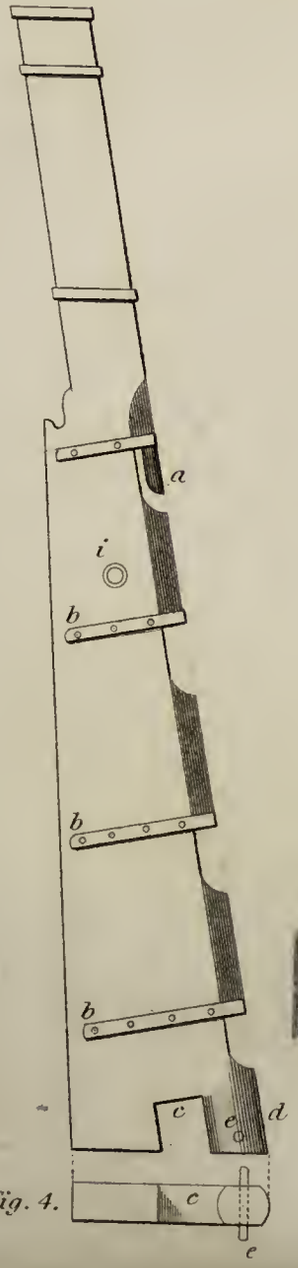
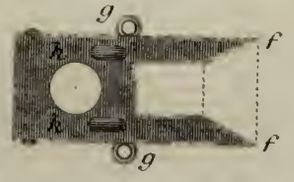



Fig. 4.

Fig. 5.



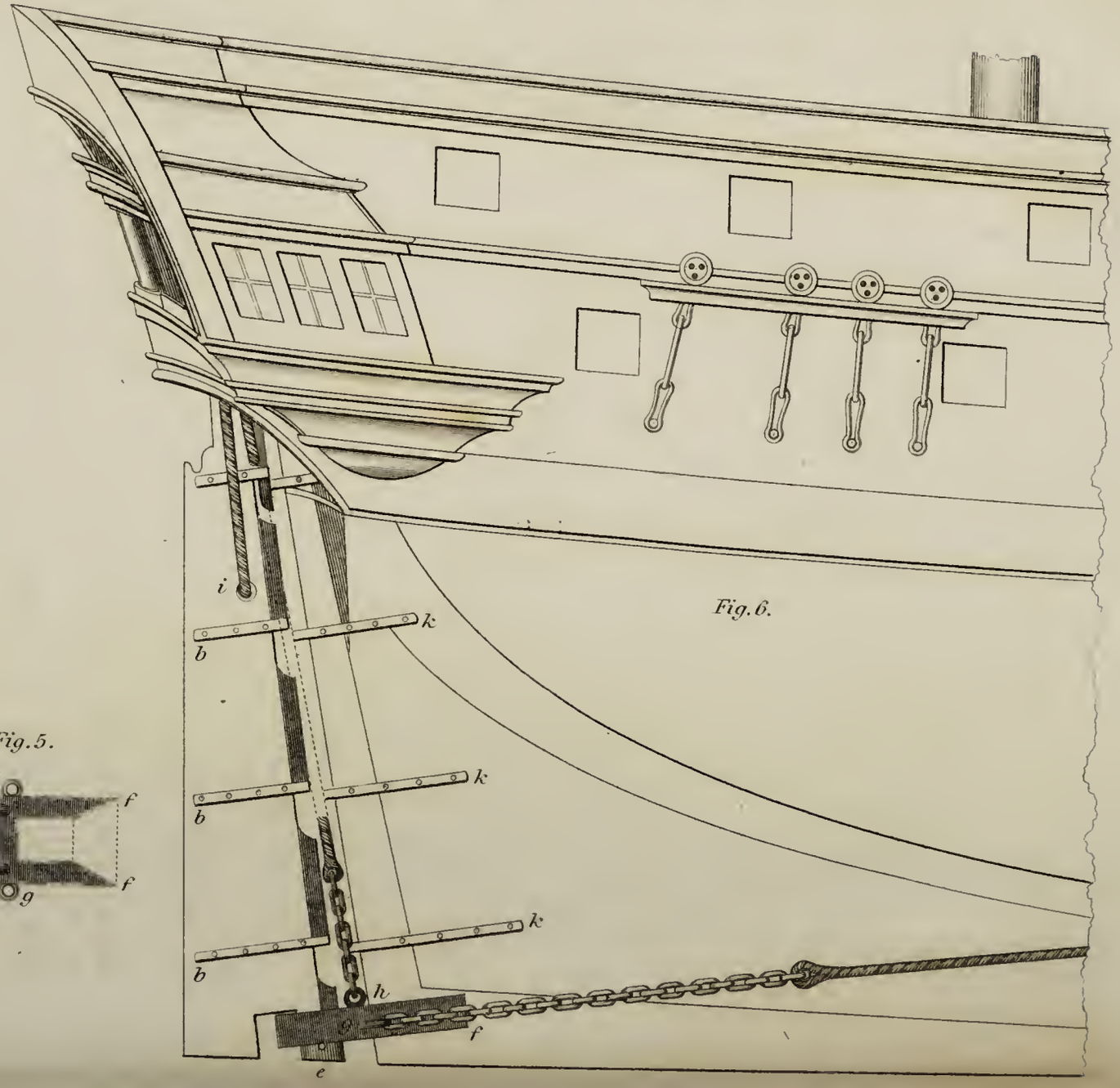




Fig. 6.

*Reference to the engraving of Mr. Wilson's machine for sweeping chimnies.*

Pl. 23, fig. 1. The machine.

A, the brush composed of quill feathers, and stout slips of whalebone, fastened by means of a string round the end of a pole; the upper feathers and slips of whalebone pointing downwards, the lower ones upwards; as is more plainly seen in fig. 2.

B B B, three lengths of pole fastened together by the joints C C, which latter consist of two wire hooks, fastened to the ends of the poles, fig. 3, and covered by the ferrule, fig. 4.

Fig. 5, is another form of the machine, in which the brush is moveable.

D, is a pulley fixed near the end of the topmost pole, and represented at large in figs. 6 and 7.

E E an endless cord, rove through the pulley, and fixed to the top of the brush, by the ring F (shown at large, fig. 8.) and to the bottom of the brush by a hook.

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*The Thanks of the Society were this Session voted to Captain* T. M. Bagnold, *of the Royal Marines, for the following communication respecting a Rudder of his construction; an Engraving and Description of which are annexed.*

DEAR SIR,

Herewith I transmit you a drawing, explanatory of the mode by which the rudder of his Majesty's ship *Arab* was rendered

rendered serviceable after sustaining material injury in a tremendous gale off the banks of Newfoundland. Three of the pintles were completely gone, and the fourth was sprung three parts through—in five minutes more, the rudder must have been inevitably lost. The idea suggested itself to me, as modification of captain Pakenham's plan applicable to the repairs of an old rudder, instead of forming a new one; indeed having lost our carpenter and most of the useful hands by the yellow fever, I much doubt if we could have constructed it in eighteen days: it brought us into Lough Swilly, in the north of Ireland, blowing hard all the way; where having fitted it with new hawsers, we sailed for Portsmouth; and the officers of that establishment conceiving it perfectly secure, sent us without any alteration round to Woolwich, where the ship was paid off.

I am, Sir,
Your sincere friend and servant,

T. M. BAGNOLD,
CAPTAIN R. M.

*No. 7, High-Kay, Knight's bridge, January,* 1817.

To A. AIKIN, Esq. Sec.

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*Reference to the engraving of Captain Bagnold's temporary rudder. Plate 24.*

Fig. 1, the Arab's rudder in the state it appeared when taken on deck, all the pintles gone, except the upper one (*a*) which was sprung half through; *b b b* shows the braces of the broken pintles (of copper).

Fig. 2, the rudder, having a piece of about one foot square *c*, cut from its heel, leaving the main piece entire, the

the foot of which *d* was rounded to make an artificial pintle, and an augre hole was bored through it at right angles to the keel, to receive an iron bolt *e*, meant as a forelock to keep the rudder and artificial gudgeon together.

Fig. 4, is an end view of the rudder thus prepared.

Figs. 3, 4, plans of the bottom of the rudder in its original and altered state.

Fig. 5, the artificial gudgeon, made out of a spare cap, the dotted lines show the part cut out, forming a pair of jaws *f f* to embrace the stern post *g g*; and *h h* the vertical and horizontal eye bolts.

Fig. 6, a view of the ship's quarter, with the rudder fixed. The cap, or artificial gudgeon, is secured to the rounded end of the rudder by the bolt *e*, which serves as a forelock. To the horizontal eye bolt *g*, a chain and hawser was fitted on each side, the ends of which passing under the ship's bottom were brought in at the bridle ports, and set up forward from the vertical eye bolts *h*; another hawser on each side supported the weight of the whole; the ends were brought up the rudder case, and secured; to avoid confusion in the engraving, the course of them is shewn by a dotted line. A hole was made in the rudder at *i*, and a strong hawser passed through it as an additional security; the head of the rudder on deck was fitted with a collar formed by a couple of planks with a corresponding semicircular excision in each, as recommended by captain Packenham; *b b b b* the gudgeon braces.

*The* GOLD MEDAL *was this Session voted to* DAVID D. DAVIS, M. D. *of Charlotte-street, Bloomsbury, for a Craniotomy Forceps. The following Communication was received from him, and one of the Instruments is preserved in the Society's Repository.*

SIR,

You will oblige me by submitting the accompanying memoir and models of midwifery instruments to the inspection of the Society for the Encouragement of Arts, &c. The two larger models are varieties of an instrument constructed essentially upon the same principle, but adapted for different cases of difficulty. I propose to give them the common name of Craniotomy Forceps, and to distinguish them by the additional epithets of single, curved, and double curved. The smaller instrument is intended to bring away uterine or vaginal polypi, after their previous separation from their base, and may therefore be called uterine polypus forceps. I shall be happy to afford to the Society any explanation of the uses of the above instruments that may be deemed expedient.

I am, Sir,
Your obedient humble Servant,

DAVID D. DAVIS, M. D.
Physician to the Queen's Lying-in Hospital, to the Lying-in Charity, and to the Central Lying-in Charity.

*No. 18, Charlotte-street, Bloomsbury, April 22, 1817.*

To A. AIKIN, Esq. SEC.

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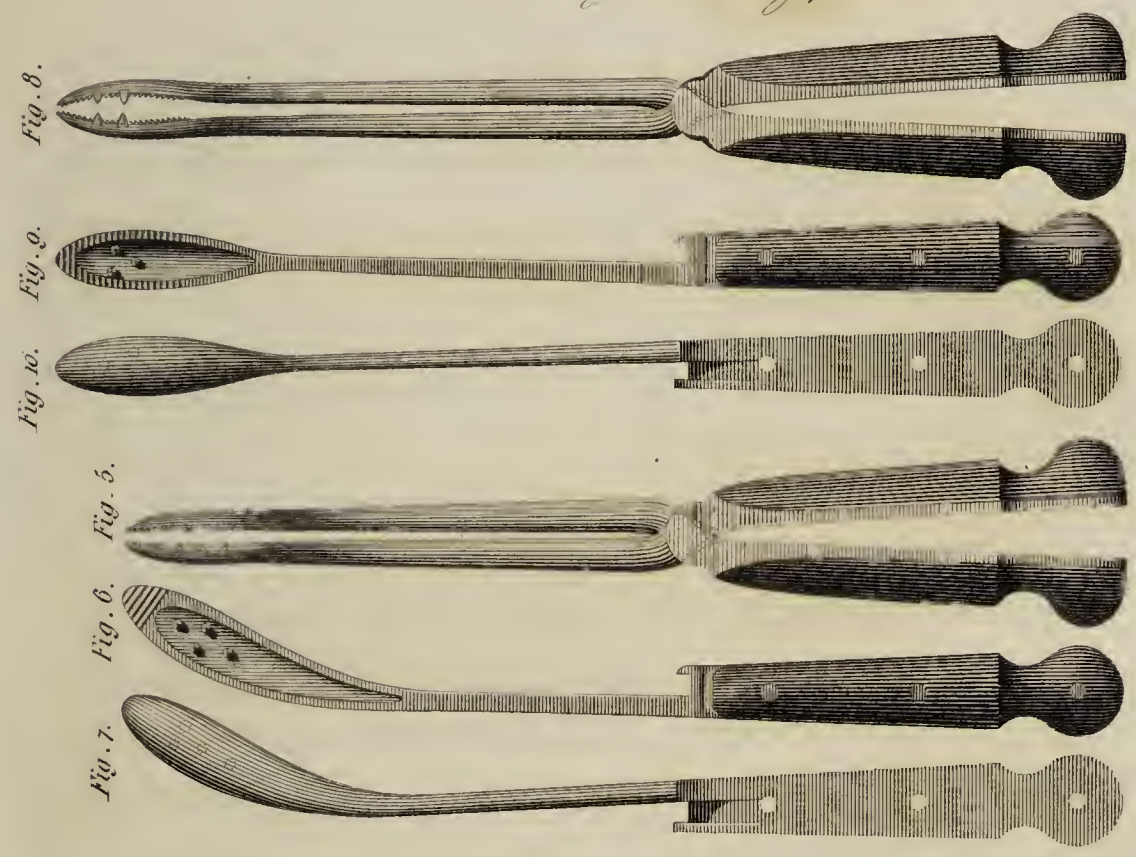
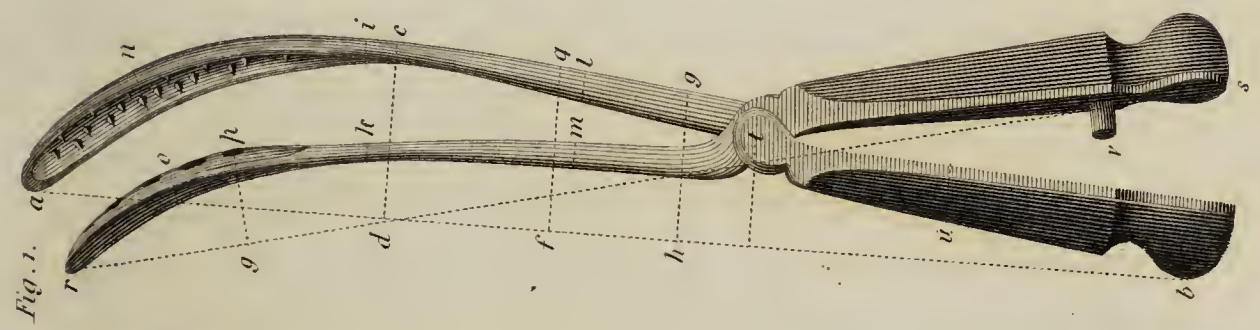
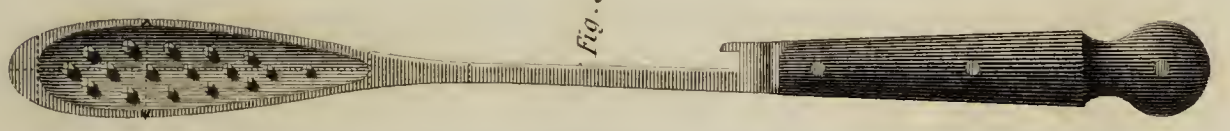
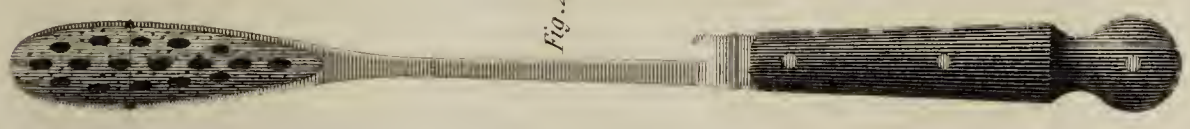
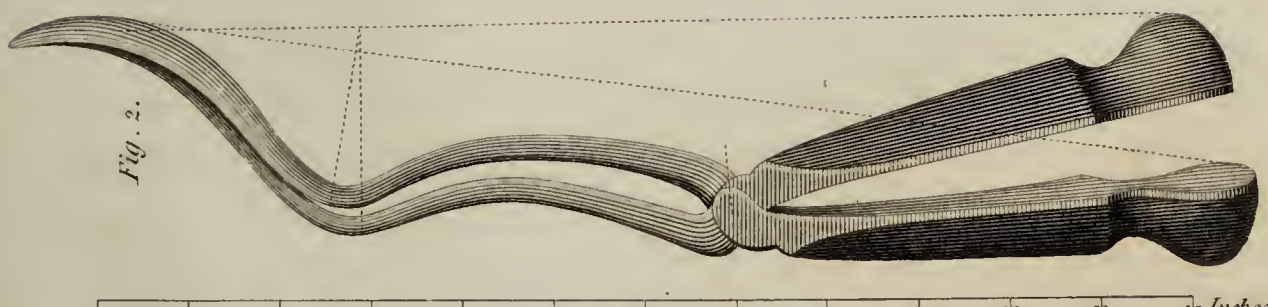
# Dr Davis's Craniotomy & Polypus Forceps.




Drawn by J Clement

Engraved by J B Taylor

It is a well known fact, that the head of the fœtus can sustain with more impunity a greater degree of pressure, for a short time, when dexterously applied by art, than a much less degree applied during a longer period, by the protracted and exhausting exertions of the natural powers. Hence the expediency in such cases of having recourse to the use of those instruments, the application of which enables us to supply the defects, and at the same time to promote the intention of nature, compatibly with the probable safety of both lives interested in the result. This peculiar department of the obstetric art is an exclusive acquirement of modern times. It commenced about a hundred and fifty years ago, with the invention of an instrument in which were combined the powers of compressing the fœtal head, and of applying traction to it at or in the neighbourhood of the part arrested. In what precise manner either of these effects was accomplished is not now positively known, as, indeed, it is not certain whether the first invented instrument, possessing these powers, was a *vectis* or a pair of forceps. The honour of the improvement is, however, claimed by this country, and, I believe, generally conceded to it in behalf of an obstetric family of the name of Chamberlen, consisting of a Doctor Chamberlen, the father, and his three sons, who practised midwifery in London with unrivalled reputation in the reign of King Charles the Second. Since that period, many important changes have taken place, and some substantial improvements have been made in this department of instrumental midwifery; so that the art may now perhaps be considered as being in ample possession of the resources and power likely to be suggested by a correct and practical knowledge of the anatomical principle here adverted,

verted to. There are, however, impediments to delivery, depending upon mal-conformation of the pelvis, which are beyond the reach of any expedients to be devised from such knowledge; and of these there are two classes or degrees. In some extreme cases of distortion, the cavity of the pelvis is so reduced in its dimensions as not to admit of the transmission of the child through it in any form, either living or dead. The other class holds an intermediate place between those of extreme distortion, which are proper objects of what has been called the Cæsarean operation, and those of limited confinement, admitting of relief compatibly with the lives of both mother and child. It is the intermediate class of laborious parturition that forms the proper subject of the present communication. In all cases included under this class, the space in the pelvis is presumed to be sufficient to admit of delivery compatibly with the more valuable life of the mother, that of the child, however, being necessarily sacrificed for the safety of its parent. This object is attained by an operation which, when applied to the whole or to an undefined part of the fœtal subject, is called embryotomy, and when exclusively to the head craniotomy*. This latter form of it is required to be performed when the fœtal head is too large to be expelled through the pelvis by the parturient efforts of the uterus; or when, in the absence of such efforts, delivery cannot be effected by any other means compatibly with the security of the mother's life. In its application to the dead fœtus, and perhaps in some other circumstances of extreme difficulty, this mode of delivery, contrary to the opinion of a late eminent pro-

* See Hamilton's Outlines, Difficult Labours, chap. ii. s. 2.

† Hippocrat. Op. cura Fœcii, tom. i. p. 618. Philom. apud. Ætium, tom. iv. cap. 23.

fessor,

fessor, was unquestionably known to the ancients †. But we are indebted to times comparatively modern, and chiefly perhaps to the obstetric practitioners of this country, for the developement of those rational and fixed principles, founded equally on an enlarged humanity and on accurate knowledge of the subject, which are now received as constituting its moral sanctions and professional obligations. The operation of craniotomy consists, as the term imports, in making an aperture into the cranium. Its object is to reduce the bulk of the fœtal head, by the opportunity which it affords for the escape or removal of a part, or of the whole of its contents. This aperture made sufficiently large, is in many cases all that is necessary to be effected, in order to ensure a speedy and a prosperous delivery; which, indeed, is then accomplished by the unassisted efforts of the uterus. In many others, however, we are obliged, in order to gain our object, to apply more or less force of extraction, either as a substitute for the exhausted action of the womb, or as an auxiliary to that power when it might be imprudent to entrust the result to its doubtful or protracted effects. It may, indeed, be asserted, that in all more difficult cases of labour of this class, the application of extracting force to finish the delivery, is an essential counterpart to the operation of craniotomy. For affording the assistance, in such cases presumed necessary, a great variety of instruments have been devised and recommended, which, however, are reducible into three kinds or classes, viz. hooks of divers shapes and powers; retractors, upon the principle of the tire tête of Mauriçeau, and parallel bladed forceps. The use of instruments, both of the first and last classes, is probably coeval with the practice of instrumental midwifery itself. Instruments of the hook class were distinctly

tinctly recommended by Hippocrates*, by Celsus†, and by Ætius‡. Hippocrates states the necessity, in some instances, of making use of two instruments of this kind, the one to antagonize the other; thus clearly anticipating the double crotchets of modern times. Albucasis§, the last of the Arabian writers, gives figures of the obstetric instruments known and used in his time Ambrose Parè ||, the father of modern surgery, gives figures of instruments of the same kind. Gregoire Peu, Maynard, and almost all the authors who have written upon the subject during the last and preceding centuries, might be added to the list of improvers or approvers of instruments of this class. Notwithstanding, however, the high antiquity and almost universal adoption of embryulcia, and its instruments under various modifications, I have always felt the strongest objection to their use, as being unsafe, under certain circumstances, in the most cautious hands, and as being extremely dangerous in those of rash, aukward, or inexperienced practitioners. The blunt hook, which I believe is a modern invention, if used carefully and properly, may, indeed, be admitted as an exception to this remark; but its powers are very limited, especially in head presentations requiring the operation of craniotomy; not to add, that even this less dangerous form of embryulcia has been attended, in many instances, with deplorable consequences.

Under the second class of embryotomy extractors to which I have referred, we may enumerate at least four varieties;

* Hippocrat. loc citat.

† Cels. op. L. vii. cap. 29.

‡ Etii op. tom. iv. cap. 23.

§ Spacch. Gynæc. in Albucasi, cap. 57. p. 446.

|| Les Ouvres d'Ambroise Parè, edit. a Lyon, 1641, Fol. p. 608-9.

viz.

viz. the tire tête of Mauriceau *, the extracting wings appended by Barton to Ould's terebra occulta †, M. Donaira's simple contrivance of a little wooden cylinder and ribband, as given to the public by Baudelocque in his system of midwifery ‡, and a modification of the same contrivance in a more operose form in the lately introduced extractor of professor Assalini §. The common and characteristic principle of all these instruments is, that they are exclusively applied to the interior surface of the fœtal skull tranversely across the aperture through which they are directed to be introduced. To the part of the mechanism so applied there is to be attached at right angles a handle made of some accessible or convenient material, by which the operator is instructed to draw down in the direction of the axis of the pelvis. To this class of instruments there are also substantial objections, affecting equally their power and their safety, and affording unquestionably a very ample and sufficient apology for the attempt to supply the profession with better.

Our third class of embryotomy extractors includes amongst its specimens the principal instrument which I have the honour of submitting to the consideration of the Society, under the designation of craniotomy forceps. The use of instruments having the forceps form of purchase to complete the delivery in cases of laborious parturition is, however, no modern invention, much less a novelty of recent date. The class, indeed, is so numerous as to admit of a subdivision of it into two or three species or varieties. Under one of these

* Traité des Maladies des Femmes grosses, tom. i. liv. 2, p. 367.

† Burton's Midwifery, p. 230, plate 16.

‡ Bandelocque's System of Midwifery, (Heath's Translation), Vol. iii. p. 167.

§ Transactions of Society of Arts, &c. for 1816.

subdivisions might be placed a species of compressing or crushing forceps. It appears probable that Hippocrates alludes to instruments of this kind when he advises the head to be seized τῷ πιέσρῳ *. I am disposed also to believe, that the *misdachs* of Albucasis, and more especially the larger forceps, were intended at least in part to diminish the fœtal head by the effect of compression. I am aware of Smellie's opinion upon this subject †, but I cannot reconcile it to the barbarous appearance of the instruments themselves as exhibited in the figures given of them by Spacchius ‡. With regard to another instrument of the same author, the forfex dentatus, of which we have also an engraving in Spacchius, it is expressly told, that it was to be used for the purpose of breaking down or crushing the head of the fœtus §. This same power appears to have been possessed by the pieds de Griffons of Ambrose Parè ||, which was, however, more particularly intended by its inventor for the envelopement and extraction of the child's head when separated from its trunk, and left in utero. I need not add, that crushing forceps might be used with considerable advantage to accomplish the additional object of extraction.

Again, embryotomy forceps admit of another very important subdivision, founded upon the different modes in which the opposite parts or halves of the instrument are connected together, or adjusted for their common and ultimate object of extraction. The different claws of Ambrose Parè's pieds

* Hippocrat. loc citat; see also his commentator. M. C. Rhemus Comment. vi. Spacch. Gynæc. p. 683.

† Smellie's Preface.

‡ Albucasis apud Spacchium, p. 446.

§ Idem, p. 447.

|| Ambroise Parè, p. 608, et sequent.

de

de Griffons are fastened together and impelled to act by an apparatus similar to that of the once celebrated specula matricis. The structure of Fried's forceps * partakes considerably of the same sort of contrivance. All other instruments of this class that I have ever seen or heard of are connected together by some sort of joint, situated in or about the centre of the instrument, and common to each half of it. But this connection may be effected either by a pivot joint, which is only moveable on its own axis, or by some other mode of junction admitting of the separation at pleasure of the two blades. Here are also to be classed all the forceps of this tribe best known in modern times; viz. those of Puisseau, Schurer †, Lyon, and lithotomy forceps of La Motte ‡. Of these the power is nearly equal, all of them (with the exception of La Motte's) being armed with long transfixing teeth. That of Dr. Lyon (formerly of Edinburgh) is best known in this country. To the instrument-makers here, however, Lyon's forceps with some little alteration are better known under the designation of Haighton's tooth forceps; because, I apprehend, Dr. Haighton is in the habit of recommending them in his estimable lectures upon midwifery. In common with those of Puisseau and Schurer, they are really a very useful and convenient instrument, and like them well adapted for the extraction of the dead fœtus, in cases of moderate confinement or distortion of the pelvis. It happens however unfortunately, that a great majority of difficulties of this kind depend upon want of sufficient space at the superior aperture of the pelvis where the application of

* Voight. de Capit. Infant. Abrupt. XL. p. 469. Haller Disput. Chirurg.

† Disput. Chirurg. Loc. Citat.

‡ La Motte Obs. p. 247, 250, 403, 404.

rivet-jointed forceps might be attended with much difficulty and inconvenience, and where generally, indeed in all cases of great confinement, the purchase would necessarily be too limited to admit of a sufficiently powerful exertion of extracting force. This remark I am very certain is perfectly intelligible to such of my readers as are practically acquainted with the difficulties to which it refers. For want of power to introduce the blades singly so as to enable the operator to command an ample purchase above the confinement or distortion occasioning the arrest, it still became necessary, in the more difficult cases of embryotomy, to have recourse to the greater but more dangerous power of blunt hooks and crotchets. But the power of introducing the blades singly has been accessible to us for more than a century, perhaps like some objects of sensation too near the organ to excite a distinct impression, it having been presented to us in a great variety of forms in those instruments which are most familiar to us, viz. the modern obstetric forceps for extracting the living child. At length, however, it was obscurely seen, and rather imperfectly and clumsily applied in an instrument which has been for some years in the possession of my friend Mr. Clarke, and a model of which I had the honour of exhibiting before the Committee of Mechanics during the last Session of the Society. I regret that I am not able to trace the history of this instrument, it having been the first specimen of obstetric forceps with parallel blades and a moveable joint. It is probable, that the capital objections to it which I pointed out to the Committee of Mechanics had the effect of preventing its admission into obstetric practice. Since that time, I have heard of another instrument which I ought not to omit noticing in this place, inasmuch as it belongs to the class of forceps with parallel

blades

blades and a moveable joint. I have ascertained the date of this to be certainly posterior to that in Mr. Clarke's collection. It has been called by Mr. Rawlins * (of Oxford) its inventor, perhaps not very correctly, the reflected forceps. To the reflected forceps I know of but one objection, but that is fatal to them; they want power. In concluding this sketch of the various contrivances to which our art has hitherto had recourse for the relief of laborious births belonging to the class here contemplated, I may be permitted to offer the instrument immediately to be described to the acceptance of my brethren, as one in which the requisite properties of ample power, perfect safety, and great facility of application are more effectually combined than in any other form of craniotomy extractor that I am acquainted with.

D. D. DAVIS, M.D.

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CERTIFICATE.

THESE are to certify, that we have seen and examined Dr. DAVIS's craniotomy forceps, and we think that the instrument is perfectly well calculated for the purpose of extracting the child in those unfortunate cases where craniotomy is necessary. It is simple in its construction, easy of application, effective in its power, and much safer for the patient than the crotchet, or any instrument now in use.

J. SIMS, M. D.
RICHARD CROFT,
CHARLES M. CLARKE.

* See Rawlins's Dissertation on the Obstetric Forceps.

*Reference to the Engraving of* Dr. Davis's *Craniotomy Forceps, Plate 25.*

In figure 1, is given a very correct representation of the general form and structure of the single curved craniotomy forceps. The relative dimensions of the different parts of the instrument may be easily found by reference to the scale.

*a b*, is a straight line drawn between the extreme points, at the ends respectively of the external blade and its handle, and subtending the curve of the instrument. This line measures thirteen inches, and gives the greatest length of the forceps.

*c d*, a line drawn at right angles at *d*, from the subtending line *a b* to the outside of the external blade, measuring $1\frac{7}{8}$ inch, showing the extreme curve of the instrument at this part where the shank begins to expand into grasping surface. N. B. The line *c d*, as represented in the Engraving, measures two inches; but this deception arises from the instrument being seen a little in perspective for the convenience of showing its grasping surfaces.

*e f*, a line drawn at right angles at *f*, from the subtending line *a b* to the shank of the external blade at *e*, the thickness of the shank inclusive, is $1\frac{3}{4}$ inch, and is a measure auxiliary to that indicated by the line *c d* of the curve of the instrument subtending respectively the right angles at *d* and *f*.

*g h*, a line drawn at right angles at *f*, from the line *a b* to the shank of the external blade at *g*, the thickness of the shank inclusive, *g* being $\frac{7}{8}$ inch distant from the centre of the joint at *t*, measures $1\frac{1}{2}$ inch, and serves to give the direction

of

of the shank between the points *c* and *g*, relatively to the curvature of the grasping blade.

*i* and *k*, measuring each about $\frac{3}{8}$ inch, are intended to exhibit the strength of the shanks at or near their expansion into blades.

*l m*, measuring each something more than *i k* respectively, are intended to exhibit the perpendicular strength of the shanks at the distance of two inches from the centre of the joint.

*n*, is intended to direct the reader's attention to the grasping part of the external blade. This part of the external blade is hollowed out like a spoon, from the bottom of which project perpendicularly upwards seventeen sharp and angular teeth. The points of these teeth, however, are under the level of the brim, by which the operator is enabled to introduce and withdraw this blade at pleasure, without the risk of injuring the mother.

*o*, the perforations in the convex surface of the grasping part of the internal blade are here wished to be represented. These perforations are also seventeen in number, and are arranged in such a manner as to receive very accurately the corresponding teeth of the opposite blade. The convexity of the internal blade, which is effected without prejudice to the weight of the instrument by the apposition of hollow plates, corresponds with great precision to the concavity of its opposite external blade. Hence, it is evident, that the convex surface of the internal blade upon the instrument being adjusted at the lock, must have the effect of pressing any intermediate substance upon the teeth of the external blade. But the external blade is to be applied to the outside of the child's head, a substance which is not a little compressible and penetrable, while the internal blade is to be introduced

into the cavity of the skull, the operation of craniotomy having been previously performed. The bones of the fœtal skull being at this period thin and pliable, the convex surface of the internal blade will have the effect of pressing the scalp into the cavity, and upon the teeth of the external blade. Thus armed with seventeen transfixing points which are forced to penetrate into the scalp and cranium of the fœtal head, it is manifest, that the craniotomy forceps cannot readily slip.

*p q* a line drawn at right angles, at *q*, from the line *r s* to shew the greatest degree of curve of the internal blade. This line measures $1\frac{1}{12}$ inch.

*r s* a straight line drawn between the extreme points of the internal blade and its handle. This line measures $12\frac{3}{4}$ inches.

*t* the loose joint borrowed from the common obstetric forceps.

*v* a brass nut projecting at right angles from the metallic surface of the handle of the internal blade, intended to be received into a corresponding perforation in the opposite handle. For this contrivance, I am indebted to Mr. Batschan, * the maker of the instrument. Its object is to admit of greater play at the joint, and, at the same time, to insure an accurate adjustment of the grasping surface.

From the above description of the single curved craniotomy forceps, the mode of using the instrument will be readily anticipated. Each blade is to be introduced singly. The concave external blade is to be conducted along the palm of the practitioner's left hand, and along the fingers, and

* Mr. Batschan resides at No: 35, Worship-Street, Finsbury-Square. He works for most of the surgeons' instrument-makers in London, of any of whom, therefore, the instrument may be purchased :

applied

applied to that part of the external surface of the fœtal head, which may happen to be nearest, or in opposition to the sacrum of the mother. It should be carried sufficiently far to insure an ample purchase, and also beyond the point of confinement or distortion, where the obstacle is presumed to be greatest. After the escape or removal of a sufficient quantity of brain, this part of the operation will be found, in most cases, extremely easy. The next step is to introduce the internal blade through the aperture previously made in the presenting part of the fœtal cranium into the cavity of the skull. The grasping surface of the instrument is then to be brought firmly together by a cautious adjustment of the lock. The accuracy of such adjustment having been ascertained, by a careful examination of the locking part of the internal blade in relation to the orifice in the fœtal skull, through which it has been introduced, and of that part of the surface of the head to which the grasping surface of the external blade has been directed to be applied, the operator is prepared to commence the application of extracting force. Whilst drawing down, in the direction of the axis of that part of the pelvis immediately below the presenting part of the head, the practitioner should keep the handles of the instrument firmly together, to prevent its slipping. The force of traction to be applied must be estimated by the difficulty to be overcome; the degree in the first instance to be moderate, and to be gradually increased according to the exigency of the particular case. It should be applied also preferably during a pain, or, in the absence of pains, at intervals corresponding in duration to those usually observed by nature at an advanced period of labour. The pull should be most steady, and with some little variation in its direction. In a great majority of laborious

laborious births, requiring the operation of craniotomy, the delivery will thus be speedily and safely effected. I need not observe that the power of the instrument though infinitely safer in its application than any other, should not be abused by a rude and undexterous exertion of it. It should be remembered that it is possible to tear or otherwise injure the unfortunate subjects of operative midwifery, even without having recourse to any instrument whatever.

Fig. 2, the craniotomy forceps of the second form, or the double-curved craniotomy forceps.

In cases of great confinement of the pelvis, it will sometimes happen that the frontal and parietal bones may be removed in fragments of greater or less magnitude, without, however, bringing down the remainder of the head, so as to make it engage in the brim of the pelvis, the occipital part of it remaining unmoved, and hitching over the pubis. By the removal of the anterior part of the skull and scalp, all purchase accessible to the single curved forceps is lost, inasmuch as that instrument could not be reversed in the application of its curve without causing with its shanks much and dangerous pressure upon the perinæum. For the relief of such melancholy cases, this other form of the instrument has been devised. The whole of the anterior part of the fœtal skull being presumed to have been removed by the repeated purchases of the single curved forceps, the external blade (*i. e.* the blade, as in the other case, with the teeth in its concavity) is to be introduced immediately behind the pubis, over the occipital part of the fœtal head with its polished convex surface to the pubis. The internal or grasping surface of that blade will consequently be applied to the outside of the child's head. The external or antagonizing part of the instrument must be introduced, so

that

that the convex or grasping surface shall embrace the corresponding part of the child's skull on the inside. In consequence of the double curve here adopted, the purchase sought for will be easily obtained without the necessity of laying any material stress upon the perinæum, or os coccygis: the shanks of both blades of the instrument being diverted at the curve, from the axis of the brim of the pelvis to that of the lower part of the vagina.

The line *a b* gives the united length of the external blade and handle of the double-curved forceps, and measures thirteen inches.

*c d.* This line gives in like manner the united length of the internal blade and handle, and measures about 12 $\frac{3}{8}$ inches.

*e f.* This line represents the distance of the shank of the internal blade at the centre of the curve at *f*, from the line *c d* subtending that curve, and measures two inches.

A line drawn from *g*, the centre of the curve of the shank of the external blade, the thickness of the shank inclusive, so as to fall perpendicularly on the line *a b*, gives the degree of curve best adapted for the shank of that blade, and measures 1$\frac{1}{2}$ inch.

*h* represents the joint similar as in the other case to that of the common obstetric forceps.

Figs. 3 and 4, exhibit the grasping surfaces, as well as the opposite antagonising surfaces of the shank and handle of either half of the instrument represented in fig. 1. The central teeth in fig. 3 are quadrangular, sharply pointed, and about a quarter of an inch long. Those near the brim of the concavity are necessarily shorter; they are all under the level of the sides bounding the concavity. In fig. 4, the

the perforations on the convex surface of the internal blade are represented as oval, being considerably longer in the direction of the length of the instrument, than in that of its breadth. The intention of this form being given to them is to insure a more ready penetration of the teeth of the external blade into the part of the fœtal skull immediately opposite to them, and thus to facilitate the adjustment of the instruments. The dimensions of the different parts of these surfaces may, without further description, very readily be made out by reference to the scale.

Fig. 5, represents a pair of small forceps, a little curved, to correspond with the curve of the sacrum, having for their object the removal of polypi or other tumours, occupying the passages or cavities contained in or above the pelvis; their separation from the vaginal or uterine surface having been previously effected. Each blade is supplied with three or four sharply pointed teeth, so situated, however, as not to meet upon bringing the handles together. These blades are to be introduced singly, the one on one side of the tumour and the other on the other. The practitioner, after adjusting the instrument at the lock so as to embrace the tumour firmly between the grasping surfaces of his blades, must apply a gentle extracting force in the direction of the axis of the passage, and he will thus be able, in a very short time, to remove the annoyance without the smallest difficulty to himself, or pain to his patient.

Figs. 6 and 7, are intended to represent the curve, and to exhibit the opposing surfaces of the instrument, fig. 5.

Fig. 8, represents a similar instrument without a curve. There are some varieties of tumours which occasionally infest the uterine and vaginal passages, that do not require

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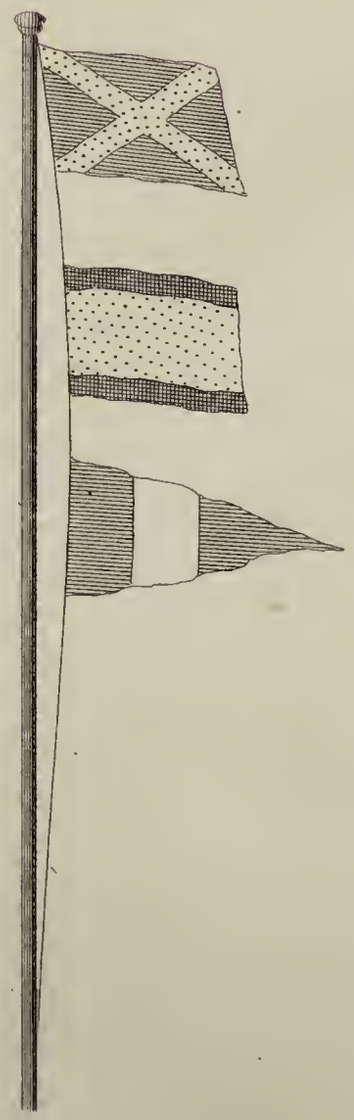

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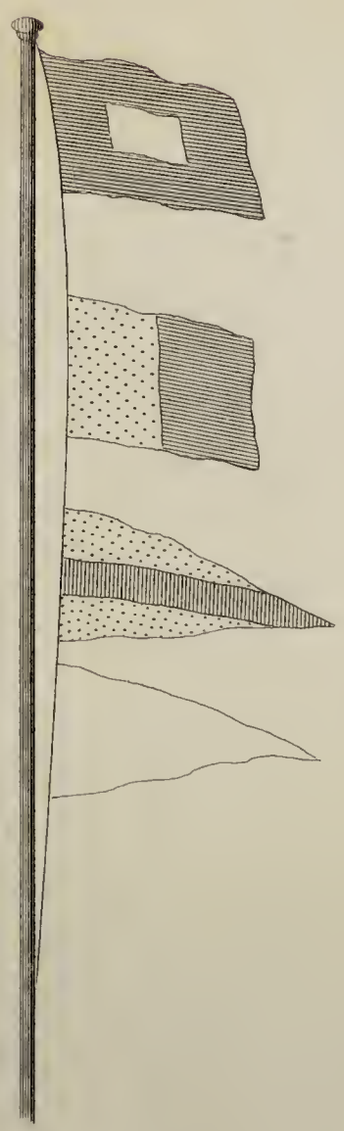

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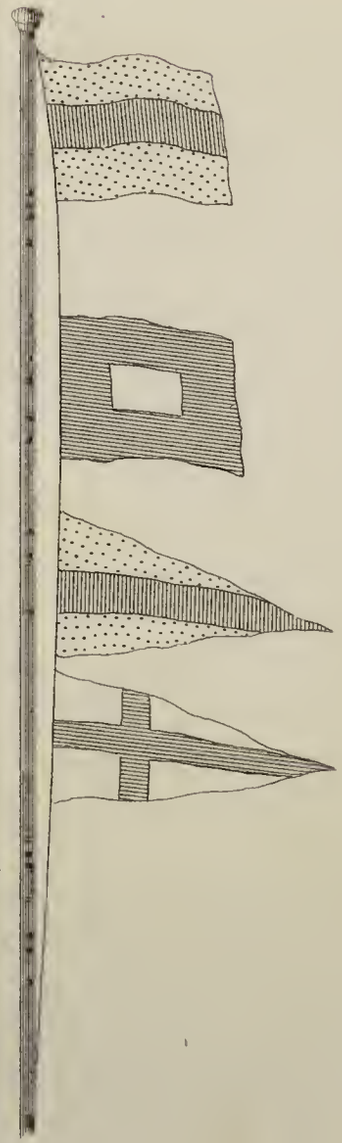

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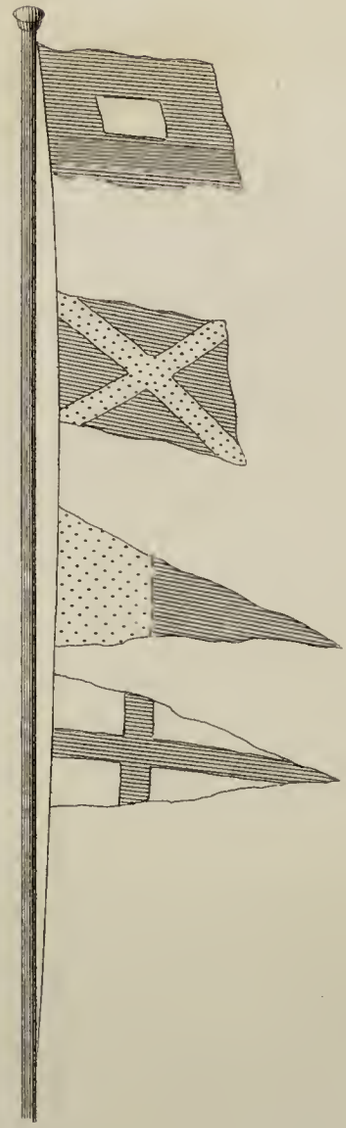

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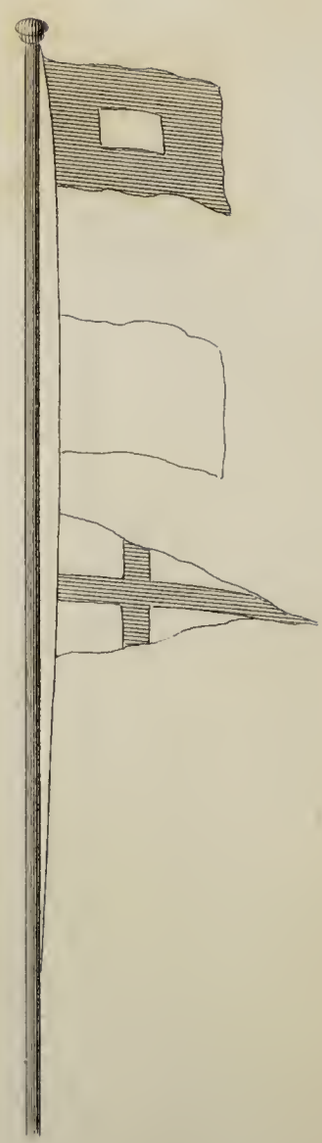

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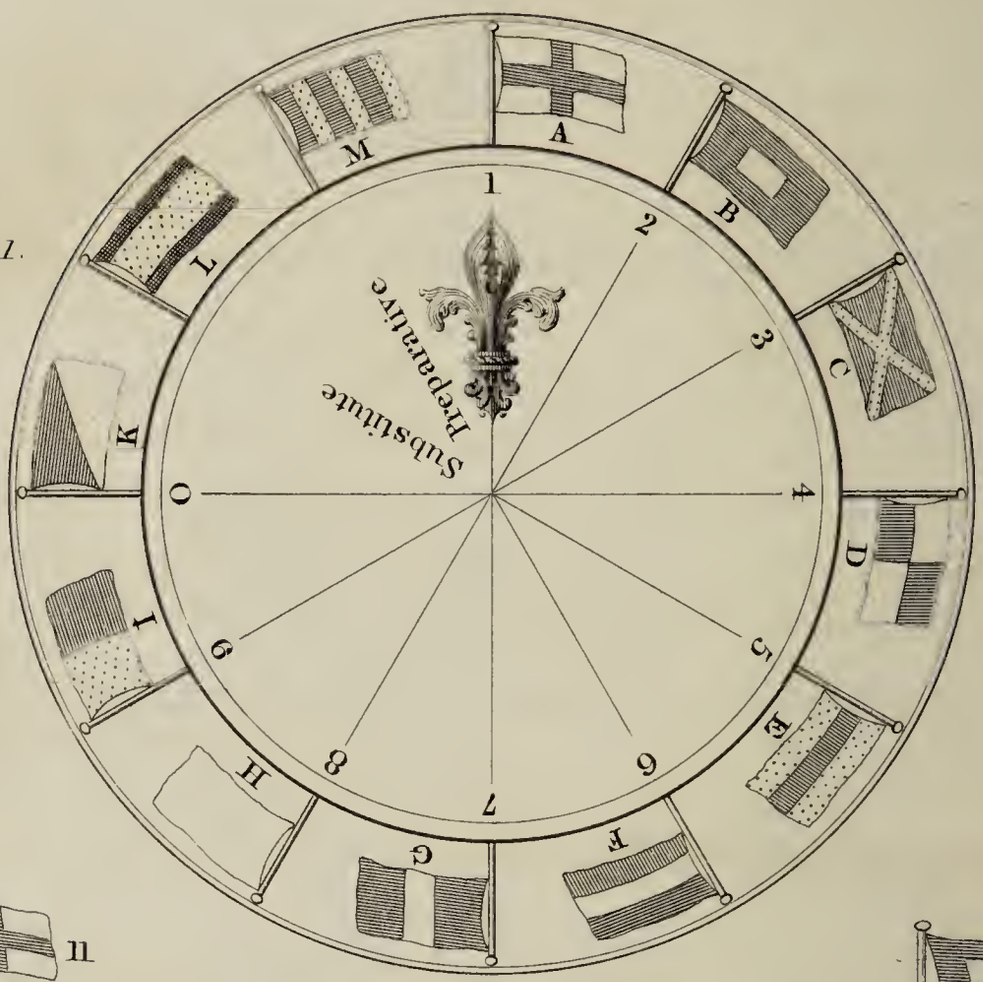
Fig. 1.



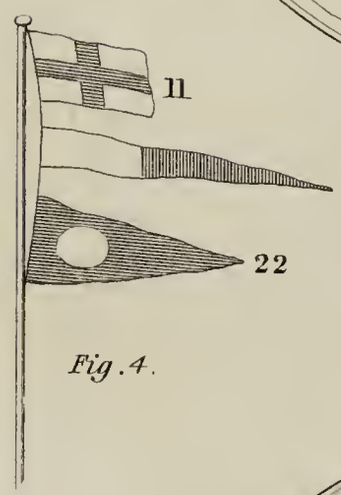




Fig. 4.

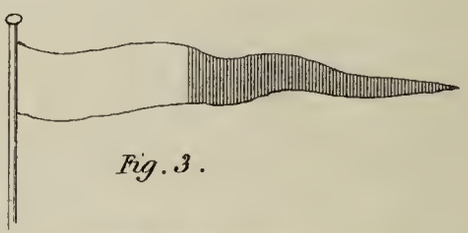


Fig. 3.

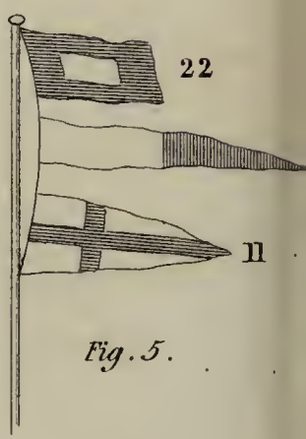



Fig. 5.

Fig. 2.

the previous step of being separated from their parent surfaces. This instrument is intended for such cases. The opposite blades are to be applied singly to the tumour, as in the former case. Then the operator is to draw down in the direction of the axis of the passage, giving to the instrument at the same time a twist to the amount, if necessary, of a semi-rotation. This mode of treatment can only be recommended for the adoption of experienced and well informed practitioners, who alone would be able to form a correct diagnosis as to the peculiar cases admitting of it.

DAVID D. DAVIS, M. D.

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*The* GOLD ISIS MEDAL *was this Session voted to Mr.* CONOLLY, *of Rolls-buildings, for a Telegraphic System, and a Dictionary, called the Acadian Telegraphic Dictionary, a Copy of which is preserved in the Society's Repository.*

THE basis of Mr. Conolly's system is a dictionary, or rather an alphabetical list of the words composing the English language, (except proper names, and some others which are not likely ever to be wanted), arranged in equal squares or parallelograms, one line under another, in a tabular form like that of the common multiplication table. The number of vertical and horizontal columns is equal, namely, 99 of each; and, therefore, the entire number of squares is $99 \times 99 = 9801$. Many of the squares contain only

only one word; but in others, where no ambiguity can arise from the practice, the radical word and several of its modifications also are arranged in the same square.

The squares being thus filled up, and the vertical and horizontal columns being numbered consecutively from 1 to 99, the vocabulary is compleated.

In this arrangement, it is obvious that any word may be expressed by stating the number of the horizontal and of the vertical column, in the intersection of which the word in question is placed. Thus, the word *boat* being arranged at the intersection of the 11th vertical and the 32d horizontal column, may be expressed by the two numbers 11 and 32, provided a method has been adopted of distinguishing clearly the vertical from the horizontal numbers.

Flags are the only signals that can be made use of at sea; and by means of 24 of these and one pendant, Mr. Conolly is capable of communicating, with expedition and distinctness, all the words contained in his vocabulary. The flags are divided into two sets, of twelve each, the form of one of which is square, and that of the other is triangular. By means of four colours, white, yellow, blue and red, variously combined and in various patterns, he distinguishes easily each of the square flags from the rest; and, as for every square flag there is a corresponding triangular one, the same arrangement distinguishes the triangular flags from each other.

Ten of the square flags denote the numerals and cypher expressive of the vertical column of numbers in the vocabulary, and the corresponding triangular flags denote the same numbers in the horizontal column. Of the two remaining square flags, one is the preparative signal, and the other, called the substitute, shews that the square flag, which

which is displayed along with it, is to be taken twice: thus, when the flag, No. 1, is displayed above the substitute, it indicates 11, as the flag, No. 2, in the same circumstances, means 22. The corresponding triangular flag is likewise a substitute for the numbers of the vertical column; and the remaining, or twelfth triangular flag, is used for a purpose which will presently be mentioned. Fig. 1, plate 26, shews the square flags, and fig. 2, the triangular ones.

The pendant, fig. 3, is used only for expedition in those cases where two substitute flags would be required: it is displayed between the square and triangular flags, and indicates that each of them is to be taken twice; thus, fig. 4 has the square flag, No. 1, and the triangular one, No. 2, with the pendant between; which implies that the upper or horizontal square intended is No. 11, and that the vertical square intended is No. 22; fig. 5 shows a similar arrangement, implying No. 22 in the horizontal, and No. 11 in the vertical column.

Hence it is obvious, that no word will require more than one display of flags, and that the number of flags in each display can never exceed four. As an example of Mr. Conolly's method, plate 27 exhibits all the signals required for transmitting Lord Nelson's celebrated signal. The first display is of three flags; the upper square one is No. 3, the lower square one is the substitute, giving together 33 for the number of the vertical column; the triangular flag is No. 7, therefore, the word intended is to be found at the intersection of the 33d vertical, and the 7th horizontal columns in the alphabetical vocabulary. In the same manner the four other displays, compleating the signal, are to be interpreted.

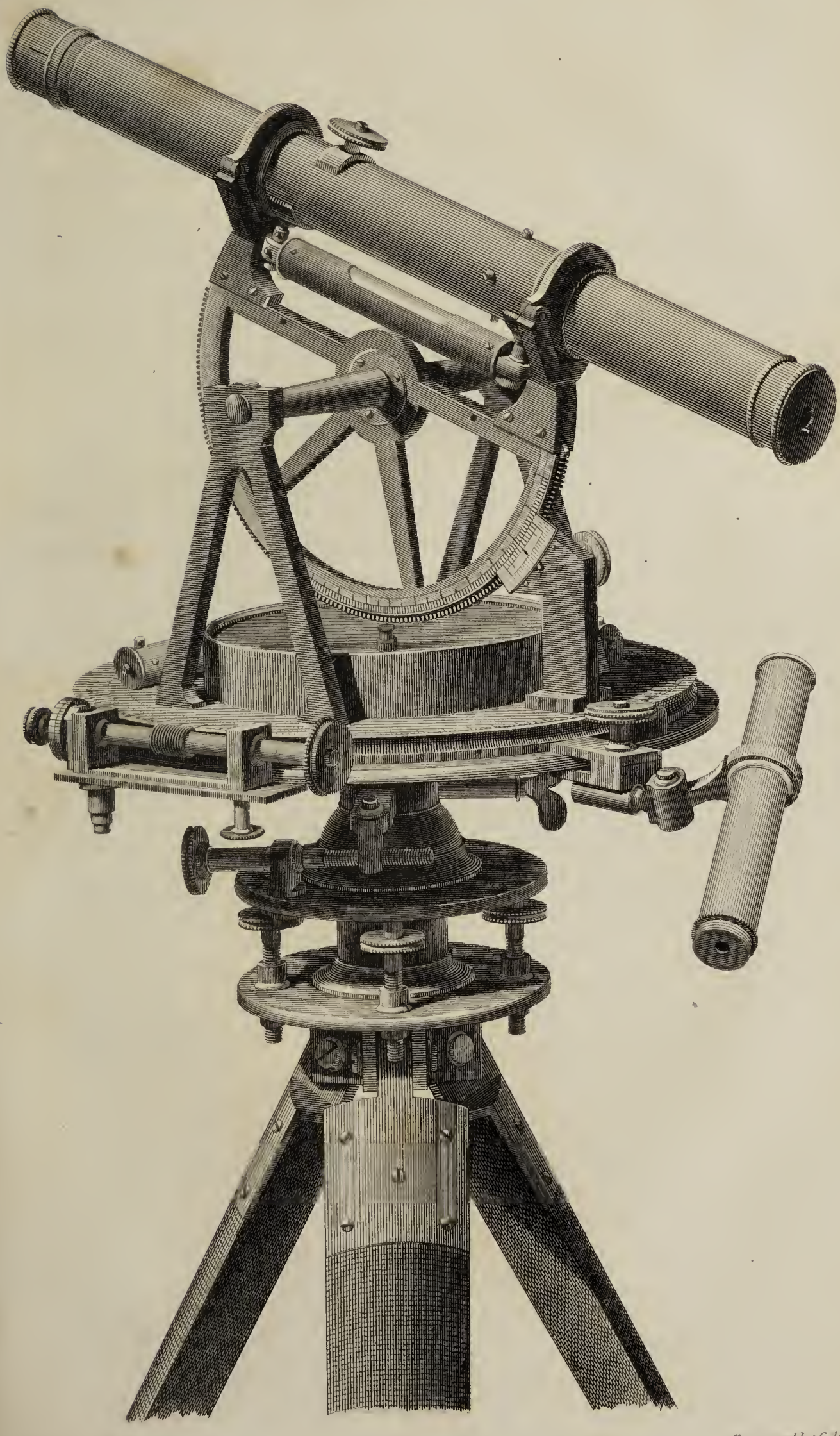
It, however, may happen, not unfrequently, that proper

names

names of men, of ships, &c. are to be transmitted; and, as it is impossible to include these in the vocabulary, recourse must be had to spelling. The signal indicative of this is the 12th triangular flag, which must be hoisted accordingly; after which the whole 24 flags are to be considered as representing the letters of the alphabet. See figs. 1, 2, plate 26.

Mr. Conolly's system admits also of almost an unlimited variety of private signals. Suppose the interior circle of figs. 1 and 2, plate 26, to be moveable about its centre, it is then obvious, that by turning it more or less, the series of numbers may be made to begin with any particular flag; nor is it necessary (although for general use very convenient) that corresponding flags in the square and the triangular series, should indicate corresponding numbers in the vertical and horizontal columns.

# Mr. James Allan's Theodolite.



Drawn by J. Clement.

Engraved by C. Armstrong

AN

# ADDRESS,

DELIVERED ON THE 27TH OF MAY, 1817,

AT THE

# Annual Distribution,

BY THE HANDS OF

*His Royal Highness the*

DUKE OF SUSSEX, &c. &c. PRESIDENT,

OF THE

*REWARDS*

Adjudged by the Society for the Encouragement

OF

*ARTS, MANUFACTURES, AND COMMERCE,*

BY

ARTHUR AIKIN, SECRETARY.

# ADDRESS,

*&c.*

THE Members of the Society of Arts are on this day met together to assist at, and to witness the distribution of those Rewards which, proposed by their several Committees they have themselves assented to and sanctioned in the course of the present Session. Conscious of having, to the best of their knowledge and as far as human infirmities will permit, pronounced an equitable and indulgent judgment on the subjects which have come before them;—desirous also of gracing this their solemnity by the presence of those whose influence on society is universally acknowledged, they have ventured to convoke the present splendid assembly. The rewards which this Society has to bestow are derived almost wholly from the moderate annual contributions of the individual members, and in a mere pecuniary point of view are comparatively of small amount; it becomes, therefore, a matter of importance, both to the institution which confers and to the candidates who receive these testimonies of its approbation and good will, that the act of distribution should be attended by all those accessary circumstances which may enhance its value.

Induced by these considerations, the Society has adopted, since the year 1787, the practice of distributing at the close of each Session the Premiums and Bounties which have been awarded during its progress, in the place of their earlier cus-

tom of bestowing them monthly in the several committees, by the hands of their respective Chairmen.

Glad as they are at all times to be honoured by the presence of their Royal President, they consider his appearance among them on other occasions as the spontaneous result of his mere good will, overflowing beyond the strict letter of the compact which connects him with the Society of Arts. But on this anniversary (without losing sight of a proper degree of respect) they claim his presence. They claim it both for their own sakes and for the sake of the candidates. A Society, consisting now of One Thousand Seven Hundred Members, from all ranks, professions, and trades, at the expence to all of some money, and to many of much valuable time;—collected together without any motives of private interest, without even the usual bait of convivial enjoyment, or the more respectable motive of chartered honours: actuated (as purely and simply as it is possible for large bodies of men to be actuated) by the liberal wish of fostering merit and of communicating useful knowledge—a Society thus constituted, and in the annual exercise of their most agreeable duty, may well lay claim to the presence of their highest Officer. But it is not so much on their own account, as for the sake of the candidates that they claim on this day the personal attendance of their President. They are well aware how greatly the worth of all favours, even the most substantial and intrinsic, depends on the temper and the manner in which they are bestowed; and it is most wise economy to superadd to their rewards whatever value may be attached to the publicity of their bestowal, and to the high rank of the Personage from whose hands they are immediately received. A premium churlishly bestowed is worth

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just as much as the gold or silver it consists of, and no more; it is a mere pecuniary gift which, to the lowest fractional denomination, may be stated in current coin. In such a spirit, this Society has never granted its rewards, and in such a spirit we trust they have never been accepted. The olive wreath of the Olympian victors, the oaken garland of ancient Rome bestowed on those who had preserved the lives of their fellow citizens, the medals conferred by our British Universities as the appropriate and sufficient reward for abilities and attainments of the very highest order, the Copleyan medal of our Royal Society, not to mention the honorary badges, accorded by their grateful country to those, who in these latter times of difficulty and danger have sustained the national independence at the personal risk of all that on earth can perish—these, with numerous similar examples, which I need not detail, shew how consonant it is to the very nature of man to be impelled to the highest exertions by the intellectual and moral motives of duty, of self-esteem, of honourable fame.

Let the Society of Arts continue to regulate its proceedings on these principles; let it wisely and consistently bestow its rewards; let it be as liberal and discriminative of its praise, as of its money and its medals, and it will deserve a higher rank than that to which it has hitherto aspired.

To encourage with any effect the Arts, the Manufactures, and the Commerce of the British Empire is no light undertaking, and any success in so difficult and arduous a work well merits the respect of the public. But a nobler praise is due to those who can efficaciously substitute to the private standard of pecuniary emolument which short-sighted pedling selfishness is too apt to apply on all occasions,

that large and liberal and prospective spirit which discerns in the general communication of knowledge the most assured foundation of individual prosperity.

Having thus stated the occasion of the present assembly, and the common bond and spirit by which the members of this Society are united and actuated, I proceed, agreeably to the annual duty of the office which I have the honour to hold, to give some account of the origin of the Society, and of the system of internal management which it has adopted from experience as best fitted to carry its objects into effect.

In the year 1754, when the agitation occasioned nine years before that time by a forcible attempt to bring back the exiled Royal Family had subsided, and when the youthful promise of the Heir to the Throne, our present Sovereign, had disposed the minds of men to look forward with pleasing and hopeful anticipation of the future, Mr. William Shipley, supported by the patronage and co-operation of Lord Folkstone and Lord Romney, laid the foundation of this Establishment. He had long projected the institution of a Society for the express purpose of encouraging the Arts, Manufactures, and Commerce, of the kingdom. The design was grand and attractive, the time was favourably chosen, the object seemed practicable and likely to be productive of much public utility; subscribers in consequence flowed in with a rapidity exceeding probably the expectations even of the founder. In the course of a few years the business of the Society became so multifarious and important, that it was necessary to arrange and classify it in order that every subject might receive its due share of consideration. Hence arose the institution of Committees,

tees, to each of which was assigned its peculiar department; and subsequent modifications were introduced, from time to time, for the most part well calculated to ensure impartiality and dispatch of business, till the Society acquired the form which, with no very material change, it retains at the present day.

To exclude the members of this Society from the right of becoming candidates for its rewards, would have operated as a direct discouragement to the institution itself, and would have deprived the public of many valuable communications. But the Society, aware that this right, like all others, might be abused to selfish and party purposes, has wisely gained the full advantage of the concession, and at the same time secured itself against almost the possibility of the abuse, by resolving that no reward, except an honorary medal, shall in any case be bestowed on a successful candidate who is at the same time a member of the Society. This rule is an important one on many accounts, but especially because it has the force of a direct declaration that the essence of the reward consists in the *honour*; that the difference between a silver and a gold medal does not depend on the relative commercial value of the materials out of which they are formed, but on the greater or less degree of merit of which the Society has chosen that it should be the representative. A medal of bronze, a cameo like the sculptured gems of ancient Greece, in short, any object combining the qualities of permanence and fine art would answer the purpose equally as well; perhaps, even better, as then all idea of money value being excluded, no mistakes or misrepresentations, except wilful ones, could possibly occur.

To detail the rules according to which the Society regulates its private affairs would be both superfluous and impertinent on this occasion; but it may be satisfactory to learn the means which have been adopted, as upon the whole the most efficacious, for securing the Society against imposition and private intrigue, and the candidate against hasty, prejudiced, and incompetent decision.

After a communication has been sent in, it is reported to the Society at their next weekly meeting: and at the same time it is read short merely for the sake of ascertaining to what committee it may with most propriety be referred. It is then placed by the Secretary on the list of the committee to which it has been submitted, till its turn arrives for being taken into consideration. Notice is then given at the general meeting of the Society immediately preceding the meeting of the committee, that the subject will be entered upon on such a night, which is also repeated in the general summons sent to those who are in the habit of attending on committees. Summons at the same time are sent to the candidate himself, and to such persons, whether of the Society or not, as are known to be particularly conversant with the subject in question. After these preparations the communication is read in open committee, (for every committee is open to the attendance of any member) and a short discussion, or rather conversation, on the questions to be put to the candidate generally ensues. The candidate is then called in, and gives, in his own way, an account of his invention, and, if it is accompanied by any model or drawing, explains these at the same time: questions are then put to him through the chairman, on the suggestion of any member present, and these being answered by the candidate, he is requested

quested to withdraw. A full and free discussion of the matter then takes place in the committee; and those gentlemen, not of the Society, who have been invited by summons to attend, are requested to favour the company with their observations. If in the course of the investigation it is thought advisable again to question the candidate, he is called in accordingly. At length, when by general consent the subject has undergone sufficient discussion, the draft of a resolution is handed up to the chair, and the sense of the meeting is collected by the open votes of the members present. If the opinion is in favour of the matter before them, it is generally expressed in three resolutions: the first merely declaratory of the novelty, the merit, the importance, &c. of the invention. The second is a recommendation to the Society that a particular medal, or a specified sum of money, or both, be conferred on the candidate; on condition of his leaving a full description and drawings, or a model, as the case may be, with the Society for the use of the public, and relinquishing all pretention to a patent. The third resolution is a recommendation to the Society to refer the communication to the committee of Correspondence and Papers, in order that it may be inserted in the next volume of the Society's Transactions. If the opinion of the committee is not favourable to the matter before them, it is summed up in a single resolution; stating, that such an invention being in their opinion not new, not calculated to answer its intended purpose, or liable to any other objection, as the case may happen, they cannot recommend it to the further notice of the Society. Rough minutes of all these proceedings are taken at the time by the Secretary, which, reduced into proper order, are entered into the minute book appropriated to the particular committee, and are authenticated by the signature of

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the acting chairman. It is not imperative on the committee to come to a decision on a single investigation, on the contrary they may adjourn the consideration time after time till all the evidence which it is possible to obtain has been procured; they may call for testimonials, they may institute experiments, and in short take what measures they think proper and practicable in order to come to a right decision. The above proceedings of the committee, or jury of inquest, as it might be called, constitute the first stage of the business. The second originates in the body of the Society, in the following manner.

At the general meetings of the Society of Arts, which are held every Wednesday evening during the Session, the minutes of the former meeting having been read, the Secretary proceeds to read from the minute books of the respective committees all those reports which have been concluded in the course of the preceding week. The resolutions by which each report is terminated having been twice read, are put singly to the vote. If the Society, acquiescing in the recommendation of the committee (as is usually the case) gives its vote accordingly, such vote is entered on the general minutes; and being confirmed by the next succeeding meeting is considered as concluded, and notice to that effect is transmitted to the candidate. But it is in the power of any individual member at either of the general meetings, on giving his reasons for so doing, to move that the matter be remanded to the committee for farther consideration; or, if his objections are merely to the amount of reward proposed, to hand in a motion to that effect for decision at the present meeting. Each of these propositions, according to the common rules of transacting business in all liberally-

liberally-constituted societies, is liable to be agreed to, to be negatived, to be amended, or to be got rid of by the previous question. After, however, the Society at two successive general meetings has given and confirmed its sentence, no further agitation of the question is allowed, unless a charge of fraud or disingenuousness be brought forward against a successful candidate in bar of his receiving the awarded bounty, or in case an unsuccessful candidate chuses, after an interval of at least three months, again to send in his communication; which then by the courtesy of the Society is considered a new one, and treated accordingly.

I have thought it necessary to enter into this long and perhaps dry detail, in order that those now present who are not members may be fully aware, that the Society of Arts, in performing the duties which it has voluntarily undertaken, and which the public feeling has as voluntarily confided to its management, does in fact take every reasonable and almost superfluous, precaution to ensure the justice and equity of its decisions. Neither time nor trouble nor expence are spared in order that the meritorious inventions of ingenious men may be rewarded as far as the funds and reputation of the Society will admit, and be added, as a free contribution, to the public stock of knowledge for the benefit not only of our own country but of the whole civilized world. We possess, it is true, no patent of infallibility; and are therefore liable occasionally to be warped by prejudice, to be deceived by imposture, to err from want of sufficient knowledge, and from that natural leaning to indulgence by which in doubtful cases the Society is for the most part actuated. In all these instances we need ourselves the indulgence of

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the public; and, if a judgment may be formed from the large accession to our numbers which has taken place of late years, or from the splendid assemblage by which we are honoured on the present occasion, we are not without our share of that respect and countenance which the sense and liberal feelings of the nation bestow on institutions honestly intended for the public good.

I have already mentioned that for the dispatch of business the Society has found it expedient to establish several committees, to each of which is confided its particular department. These, however, are merely the agents of the Society at large; they can engage in no enquiry which has not been specially delegated to them, and can come to no resolutions more summary or imperative than a recommendation, liable to be cancelled or modified at a general meeting. By these, however, as I have just now shown, the essential and laborious part of the business is in reality transacted. Formerly, a select number was appointed to each committee by the Society, leaving however at the same time any other member at full liberty to attend whenever he chose. At present, the only appointments made by the Society are of two chairmen to each committee. These, like all the other officers of the Society, salaried and gratuitous,* are annually chosen, and are indefinitely re-eligible, on good behaviour, at the pleasure of the Society. The committees for the most part transact business separately, but as occasionally inventions present themselves involving questions on two or three distinct lines of enquiry, the Society has reserved to itself the power of referring such subjects to the consideration of a joint committee.

* The former class, consisting only of the Secretary, the Assistant Secretary, the Housekeeper, and the Collector,

Towards

Towards the end of each session the committees, each in its own department, are required to revise the list of premiums annually proposed by the Society; to abolish those which are obsolete, to add to those which are defective, to adapt the conditions and dates to present circumstances, to suggest new ones, and to arrange the whole in the most convenient order;—a work which requires for its proper performance a very extensive and accurate knowledge of the existing state of the Arts, Manufactures, and Commerce, not only of this, but of many other countries, of the great desiderata in all these departments, and of the improvements which are not merely desirable, but also practicable. The rewards contained in this list go by the name of Premiums; those granted by the Society for other communications are called Bounties. In a premium the conditions and the amount of the reward being fixed, the claimant having fulfilled the former, is entitled to the latter, the committee having no right to take into consideration its intrinsic merit or demerit. Whereas, in a claim for a bounty, the merit of the invention is one of the essential elements on which the report of the committee is founded.

The number of committees is nine; to each of which the secretary is the recording officer; Of these the Committee of Accounts is sufficiently designated by its name. That for Miscellaneous Matters is especially charged with overseeing the premises and furniture belonging to the Society. These two being solely occupied by private matters and arrangements of domestic economy, although very essential to the well-being of the institution, call for no farther notice on the present occasion.

The Committee of Correspondence and Papers is entrusted

entrusted with the management of every thing that is published by and in the name of the Society. Its functions are very important, as it is the medium of communication between the Society and the community at large. There is no necessary connection between literature and either Arts, Manufactures or Commerce, and many an able practical mechanician is, like the great Brindley, very incapable of expressing clearly what he conceives distinctly. Hence it is that many valuable papers are given in to the Society in such a state, with regard to arrangement and the most essential principles of composition, as to be scarcely intelligible even by the *vivâ voce* commentaries of the author, drawn out by judicious questioning, and assisted by the inspection of plans and models. The gold contained in this rough ore is to be extracted and set forth to the best advantage by the committee of Correspondence and Papers. Upon it devolves the whole detail and responsibility, not only of the literary part of the Society's Transactions, but of getting drawings and sections made by competent artists from the models or machines themselves; and of selecting properly qualified engravers, and superintending the progress of their work. The volumes published by the Society bear ample testimony to the zeal and ability which have been employed in this department.

The Committee of Agriculture takes cognizance of all subjects relating to horticulture; to the sowing and planting of trees, whether for timber or ornament; to the cultivation of land by the farmer, together with the implements used for that purpose; and to the breeding, improving, and taking care of live stock of every kind; as well as all the other innumerable details included under that most comprehensive term rural economy. The

The great importance of this art or science (for it may be called by either name) to a powerful, civilized, and densely peopled state, is self-evident; and I believe it may truly be affirmed, that in this country, the Society of Arts was the first public institution which, by opening a repository of agricultural implements, by offering premiums for the decision by actual experiment of many doubtful and momentous methods of practice, and by showing the possibility of cultivating with success many important and unusual crops, but which political emergencies may render objects of the first consequence, elevated British agriculture to the rank of a liberal art. To renew in the forests and woodlands of the country the succession of oaks and of other valuable timber, which the wants of society in general, and especially of the naval department of the public service, are perpetually consuming, has ever been a leading object with this Society. It is, I apprehend, perfectly true, that, estimated according to the base maxim of the money which it will bring, it is not worth while to wait for the slow and perfect maturity of the British oak; but the crowd of ephemeral landholders whose ancestry extends no further back than a cotton mill, or a merchant's counting house, has not yet pushed from their old hereditary seats all the ancient gentry and nobility of the land. There yet remain those whose massy and magnificent oaks, nurtured by the suns and the rains, and exercised by the tempests of rolling centuries, are considered, not as an agricultural crop to be cut down and carried away to give place to some more profitable vegetable, but as a treasure bequeathed by distant ancestors to their remote posterity; which having long adorned the country, are at length to be consecrated to its most efficient defence. On such as these, and for the purpose of encouraging

encouraging in others similar meritorious and public spirited conduct, the highest honours within the power of this institution are most gladly conferred; and I am persuaded that I speak the universal sentiment of the Society when I add, that the obligation thus contracted is not less on the part of the bestower than of the receiver.

The range placed under the controul of the COMMITTEE of CHEMISTRY is very large; including the practical application of the principles of this science to useful and ornamental arts, and the whole subject of economical mineralogy. From circumstances, perhaps accidental, but not the less to be regretted on that account, the communications to the Society in this department are fewer and of less value than might have been expected. The arts of dyeing and calico-printing in all its branches; the immense details included under the head of metallurgy, containing all the intermediate processes that iron, lead, copper, tin, and all the other metals go through in passing from the hands of nature to those of the artizan; the various methods of tanning and otherwise adapting to use the skins of animals; the obscure but very important arts of preparing fermented and vinous liquors, distilled spirits, and vinegar; the manufactures of soap and starch; of glass and pottery; these, with many other branches that might be mentioned of nearly equal importance, compose an inexhaustible treasury. From this theSociety may and doubtless will hereafter present many a rich offering to the public: and we may confidently anticipate that a soil so exuberant will amply repay all the care which the Society in its collective capacity, and the members as individuals, may be pleased to bestow upon it.

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The Committee of Polite Arts is one the limits of which are not capable of being defined with perfect precision. On a question of landscape gardening, it might form a joint committee with that of agriculture, as in the present session it has, on more occasions than one, been associated with that of Mechanics. It still remains a committee of considerable importance, although, from circumstances which I am about to state, it has somewhat declined from the consequence which it originally held in this Society, The art of painting was in England sunk almost to the lowest state of abasement, during the turbulent and difficult reigns of the two first kings of the present house. A few foreigners of little merit satisfied the very moderate demands of the public in this line; native merit, if any then existed, had not even the consolation of empty praise; driven to the necessity of earning a miserable and hard subsistence by perpetual itinerancy, it pined, neglected, solitary and forlorn. The Society (as its name imports) for the *encouragement* of arts, was no sooner founded, than it began its meritorious and patriotic task of fostering by every means in its power the scanty crop of native art. The first public exhibition that was ever made by the artists of the British metropolis, took place in the year 1760, at the rooms of this Society; and was repeated there for several successive years. The elder Bacon, who, to adopt the language of one of our great Poets,

> "Gave more than female beauty to a stone,
> "And Chatham's eloquence to marble lips,"

derived from this Society his first effectual encouragement; repeated and liberal honours and rewards attested their good taste and good sense, and the artist himself ever acknowledged,

ledged, with manly and becoming gratitude, how welcome and how effectual was the patronage of this Society, while the public at large had not yet awakened to a sense of his extraordinary merit.

In process of time, and under happy auspices, the Royal Academy was founded in this city: an event which, as it gave to the Fine Arts of England a home, a center, and an establishment, rendered the further exertions of this Society in the same department no longer necessary. Still, however, the Society was reluctant wholly to withdraw that encouragement which had produced such clear and decided benefit; and it may properly be added, that an unwillingness to deprive our anniversary of one of its most graceful ornaments has of late years not been without effect.

If I may presume, in the presence of those who are so much better acquainted than myself with the practice and theory of Art, to suggest a new channel in which some of the rewards adjudged by this committee might for the future be allowed to flow, I should beg leave to introduce the subject, by observing, that in this country the fine arts appear to be restricted to two of the great purposes to which they are applicable.

This restriction, such is the tyranny of words, appears to be mainly owing to the familiar use of the term *fine art*, in place of the art of design, by which it is more correctly denominated. We cannot bring ourselves to suppose that fine art can legitimately and properly be introduced into the every day purposes of human life. In its higher forms, it is considered, and very properly, to have, like poetry,

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an intrinsic and inherent value, addressing itself immediately to the imagination and affections, and to be estimated by the power which it possesses of influencing strongly these faculties of the mind independently of all considerations of mere utility. In its less perfect state, it is considered as an elegant accomplishment; and thus unfortunately has been forced into relationship with the other accomplishments of music and dancing; and has hence been looked upon as a grace and an elegance but still a superfluity, to be acquired because it is the fashion, and to be left off when other newer, and therefore still more fashionable, elegancies, take their turn.

It were well, however, in my opinion, if the art of design could be for ever taken out of the class of accomplishments, and placed next to and on an equality with its truly kindred art, the art of writing. In the days of picture writing, or hieroglyphic, the distinction between the two had not yet been made, and though the discovery of alphabetical writing has made two of what was formerly one, there yet remains a natural and necessary connexion between them; and innumerable are the occasions on which the one may most successfully be employed to aid and illustrate the other.

It was the great praise of Socrates that he had drawn philosophy down from the region of clouds and mists and meteors, to dwell and converse among men. Is it not in the power of this Society to confer an analogous favour on the public, by rescuing the art of design from the gauds and toys of a vain world, and bringing it, like writing into the common and familiar use of ordinary life?

The Committee of Manufactures which, at first sight, might be thought to be the most important of all in

a Society formed in England for the express purpose of encouraging the Manufactures of the country, is in fact, notwithstanding its appellation, one of those that are the least active; not from any want of zeal or ability in the chairmen, but because the two branches into which it naturally divides itself, I mean mechanics and chemistry, are erected into separate and independent committees.

The essence of every manufacturing process is a change either in the external form, or in the internal substance of the matter which is so operated on; the former being mostly produced by some mechanical, and the latter by some chemical agency. Thus, the manufacture of wool into broad cloth is effected by means of the spinning-wheel and the loom; any improvements in which seem naturally to come under the department of mechanics, and the completion of the fabric, by dyeing it blue, scarlet, black, or any other colour, is a chemical process. Even any improvement which should affect the entire manufacture in every stage of its process, if that is conceivable, would perhaps more naturally fall under the cognizance of a joint committee of mechanics and chemistry, than of the distinct committee of manufactures. Hence it is that, under this head, so few rewards have hitherto been adjudged.

The Committee of Mechanics, estimated by the quantity of business it has to transact, is by far the most important of the whole number. Other committees hold their meetings intermittingly, according as matter arrives for their consideration. This, during the whole of the present session, (and the present session is by no means an exception to the general rule) has not failed to assemble on the Thursday

in

in every week, that being its appointed day, besides holding several extraordinary meetings for the dispatch of business. It is also a great proof of the assiduity and zeal with which the attending members of the Society perform their duty, that the meetings of this committee are also the most numerously attended.

From forty to seventy members are occupied every week, from seven o'clock in the evening to eleven and often later, in the patient and able investigation of the various subjects referred by the Society at large to this committee. Nor do the persons who thus gratuitously devote so large a proportion of their time to the public service, belong to the class of idlers in society; these, how heavily soever the load of life may press upon them, are rarely found to seek their amusement in employments where there is even the appearance of business. It is well and right that this should be the case; for, with what confidence could ingenious men submit their productions, which are all of a practical nature, to the decision of those who, not being engaged in business or active study, would be wholly incompetent to deliver a correct and sound opinion on the novelty, the utility, or the ingenious contrivance of the objects laid before them. The most active, assiduous and able of those who appear on this important committee, are men of real business, who well know the value of time, and possess generosity and public spirit enough to sacrifice so large a portion of their small leisure to the general good. To the candid decisions of such men no candidate need be ashamed to submit himself, nor doubt to experience from them that liberality of treatment which is rarely found disconnected with genius and talent. The

The Committee of Colonies and Trade closes our list. It is instituted expressly for the purpose of pointing out to the inhabitants of the British Colonies new objects for their active industry, and of opening in those distant and valuable possessions fresh sources of public wealth and private emolument. In order to be of much use, it requires active and intelligent correspondents in the more important settlements, on whose representations, founded on personal and local knowledge, the Society must greatly depend. Such were the late Dr. Roxburgh, in the service of the East India company, and Dr. Anderson, the superintendent of the botanical garden of the island of St. Vincent. To the exertions of these gentlemen the public is much indebted; one of whom may be regarded as the founder of the East India indigo trade; and the other as the zealous promoter of the cultivation of spices, and of other valuable oriental products in the islands of the British West Indies. They have died, and have left no successors behind them.

Our rewards having now been bestowed, and the observations which I have deemed it necessary to make having now been gone through, nothing remains but that, in the name of the Society, I should return thanks to those visi tor who have honoured this our annual ceremony by their countenance and presence; and to express to his Royal Highness the grateful sense which we all entertain of the dignity and ability with which he has presided on the present occasion.

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